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ON

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Introductory Address

William Lowe Bryan

Hegel has said that the important conflicts are not those between right and wrong but those between right and right, that is, where both parties are partly right and partly wrong. One of these is the conflict between the old practitioner who is not abreast of recent science and the young scientist without practical experience. This conflict occurs in every learned profession, including that of education. The old practitioner distrusts new methods which do not appeal to him as practical. The young scientist scorns the rule of thumb methods of the old practitioner. I wish today only to say that advance comes thru trying out the new methods which science develops whether or not those methods are in the outset immediately practical. Educational measurements and intelligence tests afford new methods of diagnosis. No one supposes them to be perfect. Many of them will be found defective and will be discarded. But no competent person who looks into the matter can now doubt that these new methods of diagnosis have proved their value and must be employed in larger and larger measure by the schools.

The Task of the Elementary School

Edward L. Thorndike

It has been my lot during the ten years past to carry on measurements of the educational achievements of children in school, measurements of the abilities of adults, and measurements of the contents of courses of study, textbooks, and other instruments of instruction. The more of this work one does the more one is impressed by a feeling that both the traditional, customary views of the task of the elementary school on the one hand and our educational philosophers with their criticisms and reforms on the other hand have not really faced the facts in the case. As I review the current practices which we have inherited, they seem to be unfitted to the needs of life, and to the abilities and interests of children. As I ponder the proposals of our educational reformers, they seem concerned with life in a better world than this will be in our generation or for many generations, and with children of a super-race, and with teachers of unpurchasable culture and skill.

This feeling is not at all a reproach. The traditions of the past hewed roughly, as was natural. To teach a child to read is a noble thing even if attained by such inanities as "The cat has a fat rat. The rat has a fat bat. The hat is on the bat. Hit the hat, cat." Opening the gates of the garden of knowledge has been a blessing, even if we have failed to distinguish and extirpate such weeds as "Name the capes of Africa. What are the products of Patagonia? How high is Popocatapetl?"

The claims of our educational reformers may be extravagant, but their spirit and intent and the beneficence of some of their insights are beyond question. Not only a decent modesty but also cold commonsense should warn us to listen and learn when any deep thinker speaks of the improvement of schools.

Educational measurements probably will never equal the devotion that established the common schools, nor approach the genius of the educational philosophers. They should be humble in the presence of the devotion that established the common schools and of the genius that is analyzing their work and studying their possibilities. Yet measurement has, I think, something to offer which was lacking in both the zeal of the founders of education and the acuity of its reformers.

The founder and the philosophic reformer have thought in wide, general, and consequently vague terms. They have dealt in sweeping statements—abstract rules, total policies. What measurement has to offer is chiefly detail, concrete facts, wastes here and savings there, loose links that weaken the chain, leaks that are little but that lose half the energy, improvements which the mind of large scope does not consider, but which may save the day in the actual educational battle. It has been a growing conviction with me that appreciation of such detailed facts is a great need of both our present practice and our present and future theory. Without any attempt to justify that conviction I am going to act upon it, and ask your attention to the task of the elementary school in its details.

Instead of considering whether the school should be more cultural, or more disciplinary, more academic or more vocational, more democratic or more selective, more intellectual or more aesthetic, more useful or more recreative, more uniform or more specialized, more national or more international, more conservative or more progressive, more individual or more social, I ask you to consider first how well the children of the elementary school should add! Indeed let us restrict this to the still more detailed question of how well they shall know the 45 combinations, from 1 and 1 are 2 to 9 and 9 are 18, together with their extensions to higher decades as in $21+1$ or $39+9$, and the proper procedure in carrying. I hope to convince you that so detailed a feature of the task of the elementary school as this is worth study.

One's first tendency is to dismiss the question by saying "The elementary school graduate should know those perfectly." But that is surely wrong, if taken literally, for almost nobody knows them all so as to make 0 per cent of error and to operate them in the minimum possible time. Nor would such knowledge be of much value save for exhibition in some educational museum of eccentricities. An adult of long practice in addition lacks perfect knowledge, for he can still by further practice improve his accuracy and increase his speed. If "perfectly" is not taken literally it is ambiguous.

Some of us would mean by it such knowledge that the person could add at a rate of 40 figures a minute with only 1 error in 1,000. Some of us might mean by it a rate of 80 figures a minute with only 1 error in 5,000. Some of us would require only 1 error in 10,000 but would include checking in the time and demand only a net output of say 20 figures added per minute. By any of these requirements, it may be noted, the elementary school does not now complete its task. Knowing this from familiarity with Courtis test results and the like, some of us would be much more moderate and demand only knowledge so that these operations would occur at an average rate of 60 a minute with only 1 error in 200.

Accepting this provisionally as one detail of the task of the elementary school, let us consider some of its implications and consequences. If a pupil, so skilled, added for eight minutes with Courtis test, Series B (which has exercises each with 9 three-place numbers to be added) he could do 16 or 17 of the examples and have 14 right. If he checked by adding from above down, he could complete 8 of the examples, and obtain discrepant results in 2 of them. To produce trustworthy results this ability would have to add to its uniform check a second careful checking of 1 example out of every 4. This record, tho superior to the average present attainment of elementary school graduates, does not seem entirely worthy as a school achievement in a subject which is supposed to inculcate absolute accuracy and satisfaction in truth as a result.

Perhaps, however, the Courtis test is unfair. Dr. G. M. Wilson has shown that nearly nine-tenths of the additions reported as representative of the daily life of Iowa parents are of 5 numbers or less. So let us turn our question into this form. How well must a pupil add so that with a reasonable expenditure of time he can trust his results in securing the sum of 5 numbers like $2.49, $5.25, $6.50, $7.89, and $3.75. Counting each case of holding in mind the number to be carried and each writing of a column's result as equivalent in difficulty to one addition, such a sum equals 19 single additions. On this basis and with certain additional estimates[1] with which I will not trouble you, we can compute the practical consequences for a pupil's use of addition in life according to the mastery of it he has gained in school.

I have so computed the amount of checking a pupil will have to do to obtain 2 agreeing answers (out of 2, or 3, or 4, or 5, or whatever the number before he gets 2 that are alike), according to his mastery of the elementary processes. The facts appear in Table I.

Table I. The Effect of Mastery of the Elementary Facts of Addition upon the Labor Required to Secure Two Agreeing Answers when Adding Five Three-Figure Numbers

Mastery of the elementary additions; times right in 1,000	Approximate number of wrong answers in sums of five 3-place numbers per 1,000	Approximate number of agreeing answers, after one checking per 1,000	Approximate number of agreeing answers, after a checking of the first discrepancies	Approximate number of checkings required (over and above the first general checking of the 1,000 sums) to secure 2 agreeing results
960	700	90	216	4,500
980	380	384	676	1,200
990	190	656	906	470
995	95	819	975	210
996	76	854	984	165
997	54	895	992 +	115
998	38	925	996	80
999	19	962	999	40

It is obvious that a pupil whose mastery of the elements is that denoted by getting them right 96 times out of 100 will require so much time for checking that, even if he were never to use this ability for anything save a few thousand sums in addition, he would do well to improve the ability before he tried to do the sums. An ability of 199 out of 200, or 995 out of 1,000, seems likely to save much more time then would be taken to acquire it, and a reasonable defense could be made for requiring 996 or 997 out of 1,000.

A precision of from 995 to 997 out of 1,000 being required, and ordinary sagacity being used in the teaching, speed will substantially take care of itself. Counting on the fingers or in words will not give that precision. Slow recourse to memory of serial addition tables will not give that precision. Nothing save sure memory of the facts operating under the conditions of actual examples will give it. And such memories will operate with sufficient speed.

Defining "trustworthy results" to mean such addition of 5 numbers of dollars and cents, that the individual can trust a result obtained twice in succession by independent methods, and defining "a reasonable expenditure of time" as anything less than a minute for such a 5-number task, an ability to operate the addition combinations with only 1 slip or less in 200 will give trustworthy results for such work with a reasonable expenditure of time. For if the process operates as surely as this it will operate well under 2 seconds. If we fall much below that ability, we do not get trustworthy results in even this simple adding of the household, farm, and small shop.

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[1] These concern allowances for two errors occurring in the same example and for the same wrong answer being obtained in both original work and check work.

One element of the task of the elementary school then is to give the ability to operate with the elementary addition facts under computing conditions at a precision of 199 in 200 or better. When shall it give this ability? The problem is one of balancing the time cost of acquiring this ability in any given grade against the time saving in checking of the pupil's work, especially in addition and multiplication, and other advantages due to the possession of it. I shall not weary you with more calculations and tables. But the same method of proof that the ability itself is worth while will show that its acquisition should be fairly rapid, and will locate its acquisition approximately. It should be acquired at or before the time the pupil begins multiplication with multiplicands of 2 or more figures. That will be usually about the middle of grade 3. Otherwise a pupil will have to spend time wastefully in checking his multiplications two, three, and four times. The custom of letting pupils add badly for four or five years and then curing them in grades 7 and 8, common as it is, has nothing in its favor.

I could repeat the essentials of this treatment with knowledge of the meanings of words, knowledge of the spelling of certain words, knowledge of certain facts in history and geography, ability to reason out certain conclusions from certain data, a liking for a certain poem or piece of music, some habit of courtesy, and so on with detail after detail proposed as tasks for the elementary schools.

The essential procedure is to define the ability in question, measure the consequence, in school and out, of its possession, decide what a worthy life, subject to the limitations of things as they are, requires, and find what degree of the ability meets these most economically. In the same way we can choose between locations of its acquisition in the school course.

The problem becomes, of course, very intricate when we consider the interactions of all these detailed elements of ability, one upon another. There are facilitations and interferences, and many a chance for ingenious organization of the work. The problem becomes still more intricate because factors of the pupils' interest have to be weighed in the balance. These have a large share in determining the time cost. The problem remains, however, a problem of fact—and of detailed fact—to be decided by detailed facts.

Consider another illustration of facing detailed measurable needs, aims, content, and methods rather than sweeping statements about them. Can we gain by replacing the vague aim of "morality" or "development of character" in the elementary school by a detailed bill of specifications of the school's task? Let me read parts of such a bill of specifications made out by Upton and Chassell. This is in the form of a scale of credits for character in action, and so describes the school's task in terms of maximum desired rather than maximum required standards.

The Upton-Chassell list includes about 200 items, 16 under Health and

Posture, 4 under Orderliness, 9 under Thrift, 14 under Promptness and Obedience, 7 under the intellectual values of Clear and Purposive Thinking, 18 under Initiative and Self-Reliance, 12 under Self-Control, 15 under Fair Play, 21 under Honesty and Trustworthiness, 10 under Courage and Perseverance, 13 under Sense of Public Responsibility, 6 under Refinement, 24 under Courtesy and Consideration, 8 under Coöperativeness, 21 under Generosity and Broad-mindedness, 8 under Loyalty, and 8 under Appreciation. I shall quote some of them. (The numbers indicate the number of points credit for the item mentioned, out of a total of 1,000 for the whole scale.)

Washes hands before eating. (4)
Takes a sufficient amount of time to eat properly. (4)
Does not indulge in sweets to a harmful extent. (4)
Keeps hands and material away from mouth, and fingers away from nose and ears. (4)
Puts away apparatus or materials when through with them. (4)
Anticipates his needs, and does not borrow. (5)
Saves time by having a consciousness of the daily schedule, preparing for the work of the next period when that of the preceding one has been completed. (5)
Is systematic in saving money. (5)
Does not waste paper, pencils, paints, and other materials. (5)
Comes to school on time. (6)
Hands work in on time, including home assignments. (5)
Responds instantly to signals. (4)
Passes and collects materials promptly. (3)
Puts work away quickly. (2)
Puts on or removes wraps quickly. (1)
Puts on or takes off gymnasium shoes in three minutes or less. (1)
Volunteers in the recitation. (5)
Performs such duties as are within his power, including self-help, as tying, buttoning, finding his way, telling time, and supplying simple needs. (6)
Does not sulk or answer back when reproved. (6)
Protests against anyone's taking advantage of the weak, stammerers, cripples, or other unfortunate persons. (9)
Does not let another pupil make wrong use of his work, such as copying from his examination or home-work papers. (7)
Claims no more than his fair share of time and attention, particularly in the recitation period. (7)
Works for his team rather than for himself. (9)
Follows the rules of the game scrupulously. (8)
Treats the members of a visiting team with hospitality. (7)
Does not take the property of others, without their consent. (9)
Does not copy another person's work. (9)
Endeavors to restore lost property to the rightful owner. (8)
Does home work entirely himself, or with only such help as is designated by the teacher. (6)
Keeps appointments and other agreements. (8)
Guards confidences, provided his principles are not violated by so doing. (8)
Returns promptly and in good condition articles loaned to him by another. (7)
Accepts no "dares" of a foolhardy nature. (4)
Does not leave a task until it is finished.
Considers candidates from the standpoint of the qualities essential for leadership, and elects a person because of his fitness for the position. (9)
Conforms to the will of the majority, as in the case of following a chosen leader, provided no principles are violated by so doing. (9)

Assists heartily in measures to prevent the spread of disease and sickness, such as taking care in case of colds. (8)
Takes pride in the appearance of school property, doing his part to keep the cloakroom in order; picking up paper from floor and stairs; and taking pains not to throw orange-peel or other refuse on street or playground, or to deface desks, books, pictures, walls, woodwork, etc. (7)
Is reverent in attitude during prayer, or at least does not disturb the devotions of others. (8)
Is attentive when someone else is talking, whether it be another pupil, a teacher, a visitor, or a speaker in a public place. (7)
Allows pupils in front of him or older persons to pass thru doorways or into the elevator first. (4)
Opens doors for others. (4)
Appreciates other nations and races and their contributions. (10)
Respects all forms of religion and belief. (9)

I think we do gain by supplementing our general moral policy by such concrete details of conduct. The attempt to list them at once forces the distinction between the virtues proper to childhood and those proper to adult years. It makes us define the shares of the home and school. It encourages action for the school rather than debate about the school. It protects us against subjecting the pupil's moral development to the teacher's convenience on the one hand, and, on the other hand, against sentimental neglect of the virtues of conformity and efficient life in the pupil-teacher relation.

Still more detailed specifications, such as "brings home a bag of candy without eating even 1 per cent of it" or "writes home to his parents as often as once a week" or "spends a half-hour trying to make his letter to them interesting" would serve my purpose better, but such would make a very long list.

If I should present other details, details of knowing what "unless" or "toward" or "which" means, of spelling "dear" or "mother" or "doctor" or "cough", of understanding why water runs down hill, and why smoke rises but soot eventually falls, of adding 2 3 3 to 4 1 2, of saluting the flag, or being ready to appreciate the merits of Mexicans and Chinese, and so on, treating each as a problem in detailed mental and moral mechanics, we should find certain instructive cases occurring again and again.

Again and again we would find school practice cultivating abilities which, in the case of 99 out of 100, a reasonable life will never require.

The spelling lesson in one of the better schools in a progressive state consisted of "valerian", "opodeldoc", and a dozen other equally erudite pharmacological specimens. Is there 1 chance in 100 that the pupils of a school will have to write these words?

The state examinations for elementary schools in arithmetic in the last three years in another state included these problems:

"A circular field contains 20 acres. Find the circumference." No such field probably ever has existed or ever will exist in the whole wide world.

"If ⅝ of ⅔ of a piece of land cost $420, what is the value of the whole?" There is not 1 chance in 1,000 that anybody would ever in the real world set up a problem like this, for the very good reason that he would in 99 cases out of 100 have to know the price for the whole piece in order to know that ⅝ of ⅔ of it would at the same rate cost $420. But, further, of all the land sales of the past decade, probably not 1 in 10,000 was of ⅝ of ⅔ of a piece of land. And still further, even if $^5/_8$ of $^2/_3$ of a piece of land costs $420, there is not 1 chance in 100,000 that the value of the whole piece can be correctly determined therefrom. Land is not identical inch by inch. Nor is cost always equal to value.

"Find the contents in bushels of a wagon-box 20 ft. long, 42 in. wide, and 4 ft. high. Allow 2,150.42." How many of you know what that 2,150.42 is, when to allow it, and to whom or what to allow it?

Again and again we find school practice cultivating abilities which might better be left to be acquired when the real occasion for their exercise arises.

The list of 90 words set for a test in spelling in one of our largest cities a few years ago, and published with tacit approval in a report on the teaching of spelling, included "affidavit, appraise, augment, calcimined, corpuscle, culinary, delineate, efficacious, epitaph, gutteral, incisors, magnesium, modulation, pheasant, plover, promiscuous, recreant, seraph, uncouth, valvular, veracity, and vermilion". Is it the task of the elementary school to teach everything?

The state examinations just referred to included a number of problems involving simple interest for over a year, such as

"A man borrowed $360 on September 1, 1903, with interest at 7 per cent. How much money will pay the note on January 1, 1906?"

Since interest on 999 long-term notes out of 1,000 is payable annually or oftener, and since the computation of interest and amounts for unusual times interferes seriously with learning to handle the genuine problems of the ordinary bank loan, and of savings-bank interest, it seems best to leave such rare situations as a note with over three years accumulated interest to be handled when they arise. They will probably never arise.

Again and again we find in the elementary school curriculum matters which are not at all essential then, which perplex the pupil and prejudice him against the culture or discipline they are supposed to foster, but which might be truly educative later.

In the state examinations referred to occurred this problem:

"What will it cost to fence a square mile at $1 a rod? What will it cost to fence the same area if it is twice as long as it is wide, at the same rate per rod?"

The effective solution of this second division of the problem is by simultaneous equations: $(320)^2 = xy$

$x = 2y$

Whereby $y = 226.27$ rds.
and $x = 552.54$ rds.
and the cost is $1,557.62

Apart from the rather fantastic nature of the problem, this is a fair exercise in thinking in algebra, but is it not utterly out of place as a task for arithmetic?

Among the 56 most common selections for elementary school reading, as measured by Hosic, are such as: Bryant's "To a Water-fowl", Gray's "Elegy", Holmes' "Chambered Nautilus", Lowell's "The First Snow-Fall", Wordsworth's "I Wandered Lonely as a Cloud", Shakspeare's "Orpheus with His Lute". I hesitate to impugn the common practice of the gifted authors of these instruments for instruction in reading and literature. But are these the best material to aid the elementary school in its task of improving the ability to read and interest in good reading? Will they not, at least for the boys, inspire a strong tendency to avoid reading anything more by Bryant or Wordsworth? When I find just the same selections in a seventh-grade reader and in a senior college course I wonder whether there are hidden capacities in children to which psychology is blind, or whether the authors of our instruments of instruction simply do not face the facts. If my conception of the task of the elementary school is anywhere near the truth, theirs is remote from it. You may decide.

On the other hand, again and again we should find, as with the elementary addition abilities, that a demonstrably advantageous ability is not given, or is given too late to be of full service.

Consider these divisions:

$42 \div 7 = 6 \qquad 48 \div 8 = 6 \qquad 54 \div 9 = 6$
$49 \div 7 = 7 \qquad 56 \div 8 = 7 \qquad 63 \div 9 = 7$
$56 \div 7 = 8 \qquad 64 \div 8 = 8 \qquad 72 \div 9 = 8$
$63 \div 7 = 9 \qquad 72 \div 8 = 9 \qquad 81 \div 9 = 9$

If a pupil does every exercise and every problem, oral and written, short division and long, given in the first two books of a widely used arithmetic (that is, all the work provided for grades 1, 2, 3, 4, 5, and 6), he will have had on the average 19 experiences of each of these, or about 1 every two months. If the teacher succeeds in making each pupil do, apart from the books, as much as the entire program of the books requires, the pupil will have one repetition of each of these processes per month. If the pupil is gifted, and if the teacher is so skilful that each of these produces the right answer or a very strong feeling against the wrong answer, this may be enough. For the great majority, however, it is not enough for mastery of short division, aid in estimating quotient figures in long division, facility in cancelling, and economy in checking all these.

Consider these uneven divisions: 43 ÷ 7, 43 ÷ 8, 43 ÷ 9, 44 ÷ 7, 44 ÷ 8, 44 ÷ 9, and so on to 89 ÷ 9.

If the pupil does every exercise and every problem, oral and written, short division and long, presented in the first two books of this series of arithmetics, he will on the average have 3 experiences of each of these! That is, he will have less than 1 a year! No wonder that Kirby finds that pupils showed little ability in short divisions with remainders, and great improvement from even a single hour's direct practice!

Measurements of school abilities in arithmetic, reading, and other lines show that real mastery, 97 or 98 per cent efficiency, is rarely found with even the simplest tasks. Our graduates half know and can half do many things. Such near knowledge and near skill is of doubtful value. One task of the elementary school is to give each mastery in a limited field. This task will require more time and much more teaching skill than some of our educational philosophers usually assign to it. They talk and write, at least, as if anybody can be taught the meanings of 10,000 words, the interpretation of simple paragraphs using such words, the spelling of 4,000 or 5,000 words, the correct usage of pronouns and cases and tenses, and the fundamental operations with integers, decimals, halves, thirds, fourths, fifths, and eights, and a few common per cents, in a small fraction of a school day, in grades 1 to 7, leaving its major portion for the content subjects and for various elevated, humane, and aesthetic enterprises. They seem to suggest that the pupils should organize and reflect upon and evaluate chapters which a third of them, if our measurements are trustworthy, simply cannot read with even 90 per cent efficiency.

I am willing to abandon any customary feature of the elementary school at any time in favor of anything proved to be better. If a simplified sociology of the home and community is better for children than ability to operate competently with decimal numbers, I am willing to cut out decimal operations from the elementary school's task. But I am not willing to assume tacitly that it is the task of the elementary school to teach children to operate with decimal fractions so as to get 1 answer right in 4. This view I think the philosophers really hold with equal strength, only they minimize the task, are not greatly interested in it, and so neglect it.

Again and again we find abilities which the school claims to give, but which adults do not use. These offer a series of important problems. Dr. Wilson finds, for example, that Iowa parents very seldom use decimal fractions; and Mr. Mitchell finds wage scales computed by multiplying by forty-ninths and such like instead of by decimals as we would expect. I have found that in a group of able business and professional men and their wives as one gets in the most intellectual club of a city, there is an incapacity in using decimals which would appall a mathematician.

We may hastily conclude that decimal fractions are little used in life and should be little taught in the schools. The other alternative—that decimal fractions should be much more thoroly taught in schools so that they *will be* used in life—deserves consideration, however. And this is typical of many of the tasks of the elementary school. The housewife does not know just what her roast costs per pound, because the butcher reports 6⅝ lb. roast beef $2.78, and she cannot divide by a fraction. So she spends 200 seconds and 5 cents in "phoning the butcher". Should we leave division by a fraction out of the school, or teach it more thoroly?

We may never find the words "negligent" or "appreciative" in ordinary familiar correspondence, but perhaps if people knew what the words meant and knew how to spell them, they would use them, and make their letters briefer and clearer thereby. Perhaps the resulting saving of time and misunderstanding would have more than repaid the time spent in learning to understand and use and spell these words.

Such general questions and decisions as these, as they arise out of the study of details of school life and learning and work back directly to improve it, seem to you, I hope, more fruitful than the general questions and decisions that come from reflections by minds more acute but less balanced by steady consideration of detailed facts. They seem much healthier and more helpful to me. I seem to progress better in understanding the task of the elementary school by asking which 5,000 words we should teach in the elementary school than by asking, "Is not the school over-intellectualized?" I seem to find more practical means of improvement by inspecting textbooks to measure just what they do page by page, and how well they do it, than by deciding that the organization of the elementary school class should be republican rather than monarchical.

We thus come to think of the elementary school as beginning with little children's inabilities and building up little by little, as well as looking toward the completed product of citizenship. We thus come to think of the details we are organizing as well as of the general policy we pursue. So for ten years now I have been collecting facts about the actual detailed abilities that every person of common sense would include in the task of the elementary school—what they are, how efficiently each should operate, how much practice is required to secure them, how this practice may be made interesting and vital, how each may be developed so as to aid rather than interfere with the others, and how all may be organized to foster a reasonable, thoughtful, competent personality.

I have done this because our customary practice and our general theories seemed to need constant awareness of the details of learning; and in doing it the details seem to me to give hope of a better general theory, and a sounder practice. I may be over-sanguine, but I believe that the detailed measurement of life's needs, pupils' abilities and interests, and the methods of improving the latter to meet the former, will be the main factor during the next generation both in defining the task of the elementary school and in accomplishing it.

The Standardization of Instruments of Instruction

Edward L. Thorndike

In a very valuable study made at the University of Iowa, Miller finds that ten of the most widely used Third Readers employ in all over 9,000 different words (9,025). Of these only 655 are common to all the readers. If we add words occurring at least 75 times in the ten, tho not used by all, I find this list increased by 50 words. There are then about 700 words that common consent would perhaps put in a third reader. There are over 8,000 words which might have certain claims, since persons of some considerable experience and authority have thought them worthy. There is evidently need of some standardization here. It is incredible that all of the 8,000 should be equally desirable from the point of view of word knowledge in grade 3.

Are the 700 words themselves acceptable as a part of a provisional standard of word knowledge in grade 3? Various criteria might be applied to aid our decision. We might rate these items of word knowledge for direct social utility to children. Such words as "danger", "poison", or "keep off", would then rank high. We might rate them for value in understanding sentences. Such words as "and", "if", "tho", "because", "it", "them", "which", "whose", or "their" would then rank high. We might rate them for frequency of occurrence in the arithmetic, geography, and and history books the pupils are soon to study. We might rate them for frequency of occurrence in the *Youth's Companion*, *Popular Mechanics*, *Popular Science Monthly*, and the other interesting juvenile periodicals and books. We might rate them for frequency of occurrence in *Hiawatha*, *The Tanglewood Tales*, Lamb's *Tales from Shakspere*, and other reputable reading recommended to children. We might rate them by the probable interest and vitality of the content they would be in. Such words as "Christmas", "ball", "hunt", "doll", "party", "picnic", "swim", "fish", and "automobile" would then stand high.

You will realize as I read the "A" and "B" words of the list that the 700 would all, or nearly all, be acceptable by almost any reasonable weighting of these and other criteria. They are:

> a, able, about, above, across, afraid, after, again, against, age, air, all, almost, alone, along, also, always, am, among, an, and, angry, animal, another, answer, any, anything, apple, are, arm, around, as, ask, asleep, at, ate, aunt, away (38).
>
> baby, back, bad, bank, barn, basket, be, bear, beast, beautiful, because, became, become, bed, been, before, began, behind, being, bird, black, blew, blow, blue, book, both, boy, branch, bread, bright, bring, broke, brought, brother, brown, busy, but, by (38).

If you should examine the list of 8,000 with reasonable criteria in mind, its items would be found to vary enormously in merit as candidates for admission to a standard "First 1,000 words, or first 2,000 words, or even first 3,000 words, to be known by grade 4 or earlier". Some of them indeed you would probably decide need not be known at all except temporarily in order to appreciate some poem or enjoy some story. Some you would not even present until two or even three grades later. A standardized course of study for the elementary school might reject knowledge of some of these 8,000 words from its minimum requirements altogether, either replacing them by simple equivalents, or instructing the teachers to explain them sufficiently for appreciation, but to permit them to be forgotten. Amongst others the choice would be more difficult, and the attempt to build up a "second 1,000 or third 1,000, or fourth 1,000 to be known by grade 5 or earlier" would bring us face to face with the task of defining our criteria, weighting each and making the necessary investigations of the actual uses of word knowledge by young and old, in school and out, with spoken and printed language.

With each successive 1,000 the task would become harder and harder. Sooner or later, we should have to consider average standards as well as minimum standards, standards for city children who never have seen and may never see oxen, hoes, spades, or furrows, even separate standards for boys and for girls, and possibly separate standards for those who will probably continue to grade 10 or 12 and for those who will probably drop out before completing grade 6 or 7 or 8.

Sagacious insight and vast labor are required for even approximately wise choices. Yet the need seems imperative. It is almost certain that 10 of our most popular readers for grades 4, 5, and 6 would show a total of over 15,000 different words. It is absolutely certain that they are not of equal educational merit. Yet no series of readers informs the teacher which words are to be mastered, which to be fairly well understood, which are to be understood only for the time being. And if any author had given such a classification it would have been simply his series of guesses. Wisely directed measurements of the various needs for knowledge of words and word groups seem the only hope. From these we may hope for somewhat the same gain in reading that our standardized lists have brought in spelling.

So for over five years I have spent what time was available in measuring the uses of word knowledge. The war checked this work and it is as yet fragmentary, but I invite your attention to some samples from it.

The first 1,000 words would be such as

a, about, after, again, all, alone, an, and, another, any, are, as, ask, at, away.
across, air, always, answer, anything.
afraid, against, almost, along, am, among.
above, also, angry.
ago, apple, arm, around.
able, act, add, allow, appear, asleep.
according, account, address, afternoon, afterward, age, already, although, animal, arrive, ate.
back, be, been, before, but, by.
bad, bear, because, behind, best, better, both, boy, bring, brought, brother.
beautiful, bed, began, being, bird, bright, brown.
become, between, big, blow, bread, broke.
black, book, busy.
blue, broken.

bank, basket, beat, became, body, branch.
begin, believe.
baby, barn, bedside, besides, bone, bow, break, bury, business.
beast, bit, blood, board, brush, burn, bush.

The second 1,000 would include such words as

admit.
accept, accident, agree, alive, anxious, approach, assemble.
accompany, acquaintance, alarm, active.
accustom, actual or (ly), affair, anybody, apart, appearance, arrange, attack, attend, aunt, awful.
acre, action, advance, adventure, ah, altogether, amaze, America, amount, anger, appoint, article, ashamed, aside, attract, avenue.
ball, bare, belong, below, beyond, boat, bore, bottom, brave, breath, built, buy.
bag, bell, bless, border, broad.
bay, beam, behave, blew, bold, born, box, bridge, brook, build, building, burst.
balance, bar, barrel, bean, beauty, bee, beg, beheld, belt, bitter.
base, battle, bearing, blame, blaze, boast, boil, bosom, breathe, button.
badly, bade, beach, belief, beneath, blacksmith, blessing, block, bloom, bolt, bravely, bridle, burden, butter.

The third 1,000 would include such words as

abundance, addition, advice, afford, agreeable, American, ancient, angel, arch, army, arose, assist, attempt, authority, awake.
abroad, accomplish, accuse, advantage, aid, ain't, ample, apiece, appeal, approve, avoid, area, Asia, ashore, autumn.
abandon, absurd, admiration, advise, affect, affection, agony, agriculture, alas, aloud, amuse, anchor, angle, annual, appetite, argue, arrow, associate, attention, August.
band, bark, begun, bent, berry, bid, blade, boot, borne, bottle, brighten, bringing, builder.
bacon, bake, baker, bale, barrier, bashful, bedroom, beef, behold, benefit, bestow, birth, biscuit, blank, blast, bob, bonnet, borrow, boundary, breeze.
backward, baggage, banish, bath, bathe, bayonet, bead, beard, beforehand, beggar, bellow, benefactor, betray, blackboard, blossom, blunder, bluff, bough, braid, brass, breadth, briefly, bubble, buckwheat, bunch, bureau, burial, busily, butcher, buzz.

These words are placed by the result of a count of the words in the following sources, with the application of credits as shown. This scheme of credits is rough and provisional, being primarily for the purpose of illustration.

SCORE FOR A AND B WORDS

(Count and credit as follows)

In all of 10 second readers (Housh) or 50 or more occurrences..........	4
In all of 10 third readers (Miller) or 75 or more occurrences............	4
50 pp., 45–94, of *Black Beauty*..............................	2
56 pp., 7–42 and 55–74, of *Little Women*........................	2
24 pp., *Scrooge's Christmas*................................	2
45,000 words, two issues of *Youth's Companion*.................. (very small type omitted)	2
40 pp., 1–40, *Treasure Island*..............................	1
37 pp., "Sleepy Hollow"....................................	1
49 pp., "Life of Wallace" (Scott's *Tales of a Grandfather*)..............	1
54 pp., *New Testament* (one-tenth)..........................	1
125 pp., first 25 pp. of five elementary geographies..................	1

500 pp. approx., pp. 25 to end of two elementary geographies	1
75 pp., first 25 of one and first 50 of another United States history	1
75 pp., pp. 26–100 of one United States history	1
200 pp. *Familiar Quotations* (one-fifth)	1
500 approx. two series of arithmetics, Book I	1
500 approx. two other series of arithmetics, Book I	1

The maximum credit is thus 27 for a word appearing in all.

Limited as is the count and rough as is the credit system, I venture to assert that this is a better choice of 3,000 words for a basal vocabulary than any set of readers or course of study has ever made, and is worth consideration as a provisional standard.

A series of school readers is the school's favored instrument for teaching a pupil to read, interesting him in good reading, and in general starting him on the road to the profitable use of notices, letters, papers, magazines, and books. It is obviously desirable that the school should select with care what goes into this favored instrument, which may so largely determine the school's influence on the pupil's ability and interest. What stories, what poems, what speeches appear there is not a matter of indifference. Yet, as with the words, so with the selections, there are as yet effective no concrete, workable standards.

Hosic has made an inventory of the selections found in 22 sets of school readers.[1] Over 4,000 different selections are used. Of these only 1 is used by all.[2] It is highly improbable that the other 4,300 will be of equal merit. Over 2,500 of the selections appeared in only 1 series of readers. And inspection of them with any reasonable criteria in mind will show that in fact many of them would be ruled out from use in the favored instrument, and some of them from almost any use in the elementary school.

That will be obvious to anybody who will read them and need receive no further attention from us now. What we now may profitably inquire is "Is the result of the consensus of authors and publishers valid as an approximate standard? Can we assume that the selections used by say 10 of our 20 recent readers are an acceptable core for a standard instrument of instruction? I fear not. The 57 pieces occurring in 10 or more of the series were as follows:

Allingham, "The Fairies", 12.
Anderson, "The Steadfast Tin Soldier", 10.
Anderson, "The Ugly Duckling", 13.
Bjornsen, "The Tree", 12.
Browning, "Home Thoughts from Abroad", 11.
Browning, "How They Brought the Good News from Ghent o Aix", 11.
Browning, "Incident of the French Camp", 13.
Browning, "Pied Piper of Hamelin", 18.
Bryant, "Planting of the Apple Tree", 10.
Bryant, "Robert of Lincoln", 14.
Bryant, "Song of Marion's Men", 10.
Bryant, "To a Waterfowl", 17.
Burns, "A Man's a Man", 11.
Byron, "Destruction of Sennacherib", 10.
Carlyle, "Today", 10.
Drake, "The American Flag", 10.
Emerson, "Concord Hymn", 16.

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[1] Three of these lacked the books for the upper grades.
[2] By all of the 19 complete series.

Emerson, "The Mountain and the Squirrel", 10.
Franklin, Proverbs, 10.
Franklin, "The Whistle", 10.
Gray, "Elegy, written in a Country Churchyard", 12.
Hemans, "Landing of the Pilgrims", 16.
Holmes, "The Chambered Nautilus", 14.
Holmes, "The Deacon's Masterpiece", 10.
Holmes, "Old Ironsides", 11.
Hunt, "Abou Ben Adhem", 17.
Ingelow, "Seven Times One", 12.
Irving, "Rip Van Winkle", 17.
Key, "The Star-Spangled Banner", 11.
Kingsley, "The Lost Doll", 10.
Kipling, "Toomai of the Elephants", 13.
Lincoln, "Address at Gettysburg", 19.
Longfellow, "The Arrow and the Song", 12.
Longfellow, "The Village Blacksmith", 18.
Lowell, "The First Snow-Fall", 10.
Macaulay, "Horatius", 10.
Miller, "Columbus", 11.
Moore, "A Visit from St. Nicholas", 13.
Saxe, "The Blind Men and the Elephant", 11.
Scott, "Lockinvar", 12.
Scott, "Love of Country", (Lives there a man), 15.
Shakespeare, "Orpheus with his Lute", 10.
Shakespeare, "Under the Greenwood Tree", 11.
Sherman, "Daisies", 11.
Smith, "America", 11.
Stevenson, "My Shadow", 15.
Stevenson, "The Wind", 11.
Tennyson, "The Brook", 12.
Tennyson, "The Bugle Song", 19.
Tennyson, "The Charge of the Light Brigade", 12.
Tennyson, "Sir Galahad", 10.
Thaxter, "The Sandpiper", 11.
Whitman, "O Captain, My Captain", 11.
Whittier, "The Barefoot Boy", 12.
Wolfe, "Burial of Sir John Moore", 10.
Wordsworth, "Daffodils" (I wandered lonely), 18.

The agreements of the authors do not seem to be due altogether to evidence from scientific experiment and school experience that certain selections are specially useful in helping a child to read, or increasing his interest in reading, or improving his attitude toward good reading, or informing him about the great issues of life so far as a child should be informed about them. They are so determined to some extent, but certain conventions of doubtful value are also potent. There is the convention over-weighting poetry. Seven-eights of the favored 57 are poetry. If we made up a series of readers from the selections chosen by 5 out of 22 authors we might have a series half of whose pages would be poetry.

There is the convention over-weighting what we call literary classics. This operates against selections fit for children, since the English classics are in the main written for adults. It also operates against selections about the great issues of present life, for it takes time for the world to agree that a certain piece of writing is classic. School readers thus lag behind the press and magazines. Whitman's "O Captain, My Captain" would have been more useful in school readers from 1866 to 1876 than from 1906 to 1916 when it began to be put there.

There is the general literary convention that over-weights pieces of the rather detached, unreal, made-up type. If a piece concerns an actual matter of life in the real world or is the actual words of a real man it is viewed with alarm apparently by authors as not being quite in place in a school reader. Thus what is perhaps among the finest score of pieces in the world for boys in the eighth grade to read, the oath of service taken by the Athenian boy is, so far as I can find, in no school reader.

> "I will not disgrace the sacred arms, nor will I abandon the man next to me, whoever he may be. I will bring aid to the ritual of the state and to the holy duties both alone and in company with many. Moreover my native commonwealth I will not transmit lessened, but larger and better than I have received it. I will obey those who from time to time are judging; and the established statutes I will obey, and whatever other regulations the people shall enact unanimously. If anyone shall attempt to destroy the statutes, I will not permit it, but will repel (such a person) both alone and with all. Furthermore I will honor the ancestral religion."

In respect to appeal to children's interests, the authors are, I fear, almost without chart or compass. Some of them, it is true, would deny any importance to children's interests, maintaining that whether the child does or does not like the taste of Bjornsen, Browning, Bryant, Burns, Byron, and so on, is of no consequence, that he should be made to take his doses of them regardless. Most of them, however, would probably admit that we must begin with children's interests as they are, in order to improve them; and make their errors not by neglecting childish interests so much as by mistaking what they are. Their errors are notable. Consider this poem:

How do you like to go up in a swing?
   Up in the air so blue?
Oh! I do think it the pleasantest thing
   Ever a child can do.

Up in the air and over the wall
   Till I can see so wide;
Rivers and trees and cattle and all
   Over the country-side.

Till I look down on the garden green,
   Down on the roof so brown.
Up in the air I go flying again,
   Up in the air and down.

This as you all know is Stevenson's "Swing", to you, doubtless, as to me, an attractive poem. It is included in some one of the early grades by 11 of the 22 authors. Yet children in these grades may fairly be said to detest it. It was one of 31 selections with which Miss Dunn made very careful and extensive experiments, reading 2 or 3 of them at a time to thousands of children. It was liked the least of all. The children prefer unhesitatingly and by a wide margin almost any study about an animal, or even a very ordinary description of pygmies. Much the same is true of Sherman's "Daisies". Yet these poems were probably chosen for inclusion largely on grounds of interest. Whether children's interests should have much or little weight, it is at least important to know what they are.

There are other conventions which make the agreements of the authors a very insecure basis for a workable standard content for school readers.

The agreements of the authors are not, in the case of the selections for school readers, adequate for setting standards. If we were to make up 1,000 selections as an approved list, we could not take the thousand which received the most votes from them. This holds true in fields other than reading. Common practice is something which the framer of standard contents should know and consider; but he should follow it only when it is the best way to obtain the best obtainable results. The acid test of school experiments, planned and directed with a maximum of genius and sagacity, must decide.

The same diversity is found in respect to how thoro a certain topic is taught as in respect to what topics should be taught. Consider for example the number of examples with two-figure multipliers ($\begin{array}{r}906\\ 27\\ \hline\end{array}$ $\begin{array}{r}352\\ 38\\ \hline\end{array}$ $\begin{array}{r}\$17.24\\ 65\\ \hline\end{array}$ $\begin{array}{r}96\\ 32\\ \hline\end{array}$ and the like) included in the work to the end of grade 6. I have counted these in 4 widely used arithmetics, the number being 287, 377, 478, and 725. If 40 instead of 4 books had been examined, the range would probably have been from under 200 to over 1,000. Does a pupil, for mastery of the process of correctly placing and adding his two partial products, require 1,000 examples? Will 100 do as well?

Of examples with zero in tens' place in the multiplier (like $\begin{array}{r}925\\ 406\\ \hline\end{array}$ or $\begin{array}{r}\$12.40\\ 308\\ \hline\end{array}$) there are, up thru grade 6, 25 in one book, 42 in another, 53 in the third, and 55 in the fourth. Which is the best?

The same untrustworthiness of common "good practice" is found in arithmetics that we found in the readers. The makers of these instruments of instruction may be demonstrably wrong even in their agreements. Common sense and experiment, for example, warn us to give special attention to the additions like 9 +8, 7 +9, 8 +7, the knowledge of which is not easily reinforced by everyday experiences, quick counting, and the multiplications by 2. Yet the great majority of arithmetics give far more practice on 2 + 2 than on 9 + 8 or 7 + 9. The count for 1 series up thro grade 6 shows the following results:

2 (or 12, or 22, etc.) +2	350
2 (or 12, or 22, etc.) +3	277
3 (or 13, or 23, etc.) +2	274
7 (or 17, or 27, etc.) +9	91
8 (or 18, or 28, etc.) +9	102
9 (or 19, or 29, etc.) +9	86

Greater emphasis on the small numbers than on the larger, provided the latter are given enough emphasis, could be defended on grounds of the needs of life, which may advise very fluent, rapid operation of these simplest facts about numbers. But it is hard on any grounds to defend the allotment of emphasis shown in Tables I, II, and III (below). Yet these are typical of widely used instruments of instruction. (The counts may be slightly inexact here and there, but the errors in the counts are more likely to make the case unduly favorable to the book in question than unduly unfavorable.)

TABLE I. FREQUENCIES OF SUBTRACTIONS IN BOOKS I AND II OF A THREE-BOOK ARITHMETIC

1 −1	372	15 −6	33
2 −1	214	15 −7	19
2 −2	311	15 −8	48
3 −1	136	15 −9	20
3 −2	149	16 −7	16
3 −3	189	16 −8	36
4 −1	146	16 −9	26
4 −2	142	17 −8	27
4 −3	102	17 −9	20
4 −4	205	18 −9	10
Total	1,966	Total	255

TABLE II. FREQUENCIES OF MULTIPLICATION IN BOOKS I AND II OF A THREE-BOOK ARITHMETIC

1 X 1	534	7 X 6	155
1 X 2	472	7 X 7	121
1 X 3	271	7 X 8	145
1 X 4	310	7 X 9	118
2 X 1	644	8 X 6	158
2 X 2	668	8 X 7	157
2 X 3	480	8 X 8	126
2 X 4	458	8 X 9	126
3 X 1	487	9 X 6	101
3 X 2	509	9 X 7	100
3 X 3	388	9 X 8	82
3 X 4	318	9 X 9	110
Total	5,539	Total	1,499

TABLE III. FREQUENCIES OF DIVISIONS IN BOOKS I AND II OF A THREE-BOOK ARITHMETIC

2 ÷2	386	70 ÷8	6
3 ÷2	189	70 ÷9	2
3 ÷3	240	71 ÷8	1
4 ÷2	397	71 ÷9	0
4 ÷3	66	72 ÷8	16
4 ÷4	185	72 ÷9	10
5 ÷2	136	73 ÷8	7
5 ÷3	43	73 ÷9	5
5 ÷4	53	74 ÷8	3
5 ÷5	135	74 ÷9	3
6 ÷2	256	75 ÷8	5
6 ÷3	224	75 ÷9	3
6 ÷4	68	76 ÷8	3
6 ÷5	43	76 ÷9	2
6 ÷6	83	77 ÷8	3
Total	2,504	Total	69

Defensible standards are absent. Present agreements are often demonstrably wrong. Yet it should not be hard to find out by actual investigtion and experiment whether a properly balanced instrument of instruction in arithmetic should have 0 or 5 or 10 or 20 or 30 or 40 or 50 or 60 or 80 or 100 occurrences of 64, 65, 66, 67, 68, and 69 divided by 7.

These measurements of the contents of representative arithmetics may point another moral, namely, that our actually operative standards are at times simply fortuitous, mere happenings, justified by nobody. Who of us, making an instrument for instruction in arithmetic and finding that it had practice on the subtractions as shown in Table I, on the divisions as shown in Table III, would leave it so? These things are not by decision but by neglect. The authors would not have left them so, had they known. They did not know. Neither the authors nor the publishers of these series of arithmetics, nor the committees who adopted them in state or city, knew in any detail what was in them! Nobody knew until we began to apply measurement to instruments of instruction.

Standardization as to methods is probably of less importance than standardization as to subject-matter. Concerning what is to be learned and how well it is to be learned, it seems to me we must come to some statement of a reasonable program, elastic of course to fit local needs, but rid of the preposterous variations which are now tolerated. Concerning how it is to be taught we could perhaps continue in the go-as-you-please policy with less danger. Even here, however, the actual observation and measurement of instruments of instruction seems to me highly profitable. Time is lacking for us to review or even outline the facts, and I must content myself with two illustrations, one from arithmetic and one from reading.

We are agreed that, other things being equal, each new process in arithmetic should be introduced by some vital problem which requires the process for its solution. Here are problems among those used to introduce certain steps in the subtraction of fractions in a half-dozen modern books.

1. A field contained $35\frac{9}{10}$ acres of land, and $15\frac{3}{4}$ acres were sold. How much remained?
2. Edward is $53\frac{3}{4}$ inches tall. Frederick is $51\frac{5}{8}$ inches tall. How much taller is Edward than Frederick?
3. Find the difference between $18\frac{2}{3}$ and $11\frac{3}{4}$.
4. A man bought some property for $\$92\frac{7}{8}$ and sold it for $\$105\frac{1}{8}$. How much did he gain?
5. The baby and the baby carriage weigh $38\frac{1}{8}$ lbs. The baby carriage without the baby weighs $14\frac{1}{2}$ lbs. How much does the baby weigh?

Is there any need of having so dull, irrelevant, and artificial problems as Nos. 1, 3, and 4 when there are interesting, pertinent, and genuine problems such as 2 and 5, equally meritorious in all other respects?

If not standardization, something at least is needed to protect the problem material in our instruments of arithmetical instruction from such monstrosities as the following:

Milton was born in 1608 and died in 1674. How many years did he live?

President Washington's first inaugural address contained 1,300 words. His second inaugural address contained 134 words. How many more words did the first contain than the second?

Suppose a pie to be exactly round and $10\frac{1}{2}$ miles in diameter. If it were cut into 6 equal pieces, how long would the curved edge of each piece be?

Mr. E., being asked his age, replied: "If you cube one-half of my age and add 41,472 to the result, the sum will be one-half the cube of my age. How old am I?"

A nail 5 inches long is driven thru a board so that it projects 2.419 inches on one side and 1.706 inches on the other. How thick is the board?

A man 6 ft. high weighs 175 lbs. How tall is his wife who is of similar build and weighs 125 lbs.?

My second illustration concerns the teaching of two poems as it is done in one of the best series of readers. This may be taken as on the high level for method of teaching. The two cases are chosen with no prejudice, and are typical of the method thruout the book. Yet I submit that the questions asked are far beyond the ability and interests of seventh grade pupils, and that they will make a large proportion of the boys avoid poetry. Indeed, I submit that you yourselves cannot answer them all; and that you would rather grease the automobile, or chop wood, than try to answer them!

THE DAFFODILS

I wandered lonely as a cloud
That floats on high o'er vales and hills,
When all at once I saw a crowd,
A host, of golden daffodils;
Beside the lake, beneath the trees,
Fluttering and dancing in the breeze.

Continuous as the stars that shine
And twinkle on the milky way,
They stretched in never-ending line
Along the margin of a bay:
Ten thousand saw I at a glance,
Tossing their heads in sprightly dance.

The waves beside them danced; but they
Outdid the sparkling waves in glee:
A poet could not but be gay,
In such a jocund company:
I gazed—and gazed—but little thought
What wealth the show to me had brought:

For oft, when on my couch I lie
In vacant or in pensive mood,
They flash upon that inward eye
Which is the bliss of solitude;
And then my heart with pleasure fills,
And dances with the daffodils.

1. Tell what you can of Wordsworth's life. 2. What figure of speech in the first line? Is it a good one? Think of a single cloud floating in the clear sky.

3. Name two figures in the second stanza. In what ways are the daffodils like stars? 4. What danced besides the daffodils? What is meant by "outdid the sparkling waves in glee"? 5. Explain "A poet could not but be gay". Why a poet more than any other person? What is a poet?

6. What wealth did the sight of the daffodils bring to the poet? 7. Put the last stanza into simpler words of your own. What is a vacant mood? a pensive mood? What is the "inward eye", and how does it make solitude blissful? (Do you never think of some beautiful or interesting thing that you have seen and almost think you can see it again in imagination? Does it not give you pleasure to think of, when alone? Is this a reason for looking at beautiful things whenever we can, and for looking at them so earnestly that we shall remember them? Notice that the poet did not simply glance at the daffodils; he "gazed and gazed" until they made an impression that he never forgot.) 8. Select the best lines. 9. What does the poet show of himself in this poem? 10. Memorize the poem.

TO A WATERFOWL

Whither, midst falling dew,
While glow the heavens with the last steps of day,
Far, through their rosy depths, dost thou pursue
Thy solitary way?

Vainly the fowler's eye
Might mark thy distant flight to do thee wrong,
As, darkly painted on the crimson sky,
Thy figure floats along.

Seek'st thou the plashy brink
Of weedy lake, or marge of river wide,
Or where the rocking billows rise and sink
On the chafed ocean side?

There is a Power whose care
Teaches thy way along that pathless coast—
The desert and illimitable air—
Lone wandering, but not lost.

All day thy wings have fanned,
At that far height, the cold, thin atmosphere,
Yet stoop not, weary, to the welcome land,
Though the dark night is near.

And soon that toil shall end;
Soon shalt thou find a summer home, and rest,
And scream among thy fellows; reeds shall bend,
Soon, o'er thy sheltered nest.

Thou'rt gone, the abyss of heaven
Hath swallowed up thy form; yet, on my heart
Deeply hath sunk the lesson thou hast given,
And shall not soon depart.

He who, from zone to zone,
Guides through the boundless sky thy certain flight,
In the long way that I must tread alone,
Will lead my steps aright.

Questions and Helps

1. Give a sketch of Bryant's life. 2. Explain the circumstances under which this poem was written and the similarity between the bird and the poet. 3. Explain the figures in "last steps of day", "their rosy depths". 4. Why could the fowler do the bird no harm? 5. Note the fine figure, "As, darkly painted on the crimson sky, thy figure floats along". What does this suggest? 6. Explain "plashy brink" (note the harmony between the sound and meaning in plashy), "chafed ocean side", "pathless coast", "desert and illimitable air". 7. What is the difference between wandering and being lost? 8. Why is the atmosphere called thin? 9. Note the sharp contrast between the fifth and sixth stanzas. Explain "the abyss of heaven". 10. What is the figure in "swallowed up"? How else might this sentence be expressed? Can you find any other expression so strong or satisfactory? 11. What is "the lesson thou hast given"? 12. Explain "certain flight". 13. How was Bryant's faith in God justified in his own life? 14. Point out examples of alliteration in this poem. 15. Name the figures of speech. 16. Select passages that you like best. 17. Memorize the poem.

Such facts as these lead me to think that we should try to define standards of what to teach and of how to teach it. There are not 9,000 words equally fit to be in a third reader. The 4,000 pieces American children are studying are not equally worthy of study. Of the hundreds of questions asked about a poem some are surely better than others. Whether a child knows that 65 ÷ 7 is 9 and 2 remainder and how well he knows it should not be a matter of guess work. Whether or not you agree with me that standards are possible and desirable, the facts will at least have convinced you of a still more important fact—that we are using instruments of instruction without any detailed knowledge of what they contain and what they lack. Even if we do not set up any standards for our readers, arithmetics, geographies, and the like, we should at least know what is in them!

The Use of Intelligence Examinations for College Entrance--Abstract

EDWARD L. THORNDIKE

DR. THORNDIKE distributed samples of the Intelligence Examination for high school graduates which is being used at Columbia University and elsewhere as a partial means of deciding the fitness of candidates for entrance to college, and discussed the various elements of the examination. Attention was called to the fact that no test was included in this examination until it had been demonstrated to be valuable in the selection of scholarly ability; to the fact that certain tests were specially designed to provide for the boy whose intellect operated especially with things and their mechanisms, the applications of science, and the activities of skilled trades; and to the fact that arrangements were made to test quality of thinking in problems of large scope and without speed requirement.

He explained the general plan of having at least 30 examinations, each one different from all the others in every detail, 3 being used each year. Special coaching for the examination is thus rendered profitless except in so far as it furthers the general development and ability of the candidate.

The facts showing the working of the examination at Columbia and elsewhere were reported. The correlation obtained between success in the first half-year of college work and score in the examination is .60 and the examination is notably successful in picking out individuals of special unfitness. The chief uses of the examination so far have been as follows:

1. For actual admission to college or professional school as an alternative to examinations on school subjects or certificates. It may be a generally accepted alternative for students suitably recommended, as in Columbia College, or an alternative for a special group such as students from non-certified schools, including schools outside the state, in a state university.
2. For admission to college or professional school as an additional requirement to certification.
3. For classification of students already admitted, with a view to wiser educational guidance.
4. For surveys of the intelligence of the student body, in whole or in part.

The Measurement of Educational Forces---Abstract

EDWARD L. THORNDIKE

THIS session was devoted to an illustration of such measures of the past experience of individuals in respect to their own education as can readily be made in the case of students in a college or normal school class, a group of teachers in a school system, a group of parents at a parents' meeting, or a group of representative business or professional men. The special topic used in the illustration was the disciplinary effect of studies during the period from 14 to 18 years of age. Each person in the audience reported on the facts as far as he could judge them from memory with respect to the disciplinary value per hour of time spent, of English literature, English composition, history, algebra, geometry, Latin, and science, in his own case, under the actual conditions of his own life and education. He also reported or estimated the disciplinary value per hour of time spent of unskilled labor, of skilled labor, and of teaching, on the supposition that he had stayed out of school for some months to engage in these. He also reported on the value, per hour of time spent, of ordinary athletic sports. A count of votes showed very great variability in the judgments, every study occupying all positions from the highest to the lowest. Individual experiences thus permit serious differences of opinions between individuals. The consensus of the group as a whole, nevertheless, showed very notable general tendencies. For example, Latin and mathematics were not, in the judgment of this group, of more disciplinary value to them, hour for hour of time spent, than science and history; the comparison of the vote for disciplinary value and the vote for interest showed that the subjects most disliked were not those to which the greatest disciplinary value was attributed. On the contrary, there was a correlation of about .60 between the rank for disciplinary value and the rank for interest. The results of similar records of past experience as judged from present memory were reported, which were in general agreement with the Indiana vote.

The Analysis of the Musical Mind for the Purpose of Rating

C. E. Seashore

In a lecture, fully illustrated by lantern slides and phonograph records, the speaker presented in a graphic way the analysis of the musical mind into its component talents, the method of measuring these talents, norms of distribution, and ogives for the rating of records.—Editor.

The Discovery and Encouragement of Musical Talent in the Public Schools By Means of Measurement: Some Suggestions on Organization

C. E. SEASHORE

THE analysis and measurement of musical talent by means of the so-called "Measures of Musical Talent" has been described in the references given below and was summarized in my earlier topic on this program. I shall, therefore, devote the present period to some practical suggestions about the use of this material in the public schools.

The only material needed for the conducting and interpretation of these measurements consists of the following:

1. *The Psychology of Musical Talent*, a textbook, published by Silver, Burdett, and Company, 1919, $2.40.
2. Five Columbia double disk records as follows:
    - *a.* Sense of pitch
    - *b.* Sense of time
    - *c.* Sense of intensity
    - *d.* Sense of consonance
    - *e.* Tonal memory

$7.50 for the entire set, with *Manual of Instructions and Interpretations*, obtainable from the Columbia Graphophone Company, New York.

3. *A Survey of Musical Talent in a Public School*, a bulletin, published by the Iowa Child Welfare Research Station, Iowa City, Iowa, for a nominal price.

Thus the entire equipment, which is permanent and may be used indefinitely, can be obtained for approximately $10.

The "Measures" should be introduced as a regular part of the instruction in the music course in the fifth and the eighth grades. If this is continued from year to year all the children in the school system will be surveyed twice: (1) in the fifth grade at the time at which musical instruction should be taken up seriously, and (2) in the eighth grade at the time at which the pupils should be sorted effectively for participation in various kinds of musical activities, both instrumental and vocal, and should settle definitely upon some form of music for more serious pursuit.

In a large city, where there are several supervisors, one of these should specialize in this work and should be responsible for the direction of it thruout the city. The actual taking of the records may, however, be done by the person who teaches the class in music. Thus, although any teacher can quickly learn to use the "Measures", there should be in each city someone who has studied the problem somewhat seriously and is capable of holding conferences and of aiding in the interpretation of results for the entire city.

The "Measures" and the material descriptive of them should be readily available to the older children, particularly pupils in the high school who would be interested in self-examination. Let them test themselves individually or in groups as they choose. Let family circles and community circles be formed as well as other groups for combined pleasure and information in the use of these measures for "scientific musical entertainment". When relatives and friends, with parents and children, thus gather and try themselves out a most wholesome stimulus to the recognition of talent will come to the social group.

There need be no hesitation about giving a place in the music course for this work, because anyone who tries it will find that the disciplinary value of the "Measures" in presenting such musical elements as pitch, time, and intensity is of a very high order and will be difficult to match for training value by ordinary musical exercises. The introduction of the "Measures" may, therefore, be justified both by their diagnostic value or their training value.

The reports of the results of measurements should be treated in the same way as we treat other psychological or pedagogical measurements in school, such as the intelligence quotient or records of achievement. It should, however, always be borne in mind that records of this kind should always be regarded as confidential.

After all, the follow-up work is the essential thing. There is no use in making diagnosis unless cognizance is to be taken of its meaning in relation to possible achievement. Here we encounter a difficulty,—our ignorance about the pedagogy of talent. But this should not discourage us from taking the first step, that of finding out the nature of the talent. If the objective records do no more than to serve as a concrete talking-point, which makes intelligent teachers, parents, and pupils stop and ponder on the matter, they would be worth while. But they do more,—they furnish us facts which the practical music teacher can in many respects use for exact guidance.

As pointed out by Professor Thorndike, ordinary mental tests should not be regarded as the measure of an individual, but rather as a convenient means of discovering tendencies in groups. It is, however, different with these measures, because they are quantitative and relatively exact and do measure specific capacities of an individual in such a way that the measurement can be described and the conditions controlled and repeated indefinitely.

With the facts furnished by a musical talent survey there comes a charge to the educator to organize the music course in the school in such a way as to recognize the psychology of individual differences. As a practical suggestion for the carrying out of this principle, the rule should be laid down that children should be classified for instruction in music on the basis of achievement in music and not on the basis of age or achievement in other subjects. This can be done in many ways. One way would be to put all music in singing, for example, for four grades at one hour, and divide the pupils on the ability to sing, into three groups, a superior grade and an inferior grade, each representing approximately one quarter of the entire number of pupils, and a middle grade representing the remaining half of the group. Thus, there might be a four-group of grades in the elementary, the intermediate, and the high school years respectively.

As we now recognize it is the function of the school to so teach music that it will carry into the homes; so it becomes the duty of the educator to so organize the musical offerings in the school as to bring all the musical talent from home and community into effective association and coöperation in school. The talent survey is a most effective means for the selecting, sorting, and encouragement of talent that shall go forth from school into the community.

It should be remembered that guidance in music is vastly more significant for avocational than for vocational purposes. It is only in rare cases that we are interested in selecting the virtuoso or the teacher of music, but we are deeply interested in guiding all our young people into an effective contact with music as an avocational pursuit—a pursuit which we follow, not as an occupation, but as a diversion, a means of aesthetic development, a cultural quest.

Preliminary Report on the State-Wide Mental Survey of High School Seniors

William F. Book

At the last Annual Conference, Mr. O. H. Williams, who made all arrangements with the schools for giving our intelligence tests to high school seniors, and who collected thru his office all the materials for this mental survey, made a brief report on the plans and purposes of the proposed investigation and solicited your interest and coöperation. The study has now been completed and all the results tabulated and interpreted. Mr. Williams, who has been a copartner in the entire investigation, might well have given this report today, but as the results had to be worked out here in the laboratory he preferred that I should make the report. But I desire, before beginning, to take this occasion to thank, for myself and Mr. Williams, the State Board of Education and its president, Superintendent L. N. Hines, and the more than 500 superintendents, principals, and teachers who assisted in this investigation. Without their coöperation and enthusiastic, painstaking assistance this study could not have been made. I believe it is only thru such coöperative undertakings that our most important educational problems can be investigated and solved.

I. AIMS OF THE SURVEY

The general purpose of this mental survey of high school seniors was fourfold:

1. To locate by means of reliable mental tests the ablest pupils graduating from Indiana high schools during the year those possessing *superior* and *very superior* mental endowment, and to make arrangements whereby these specially gifted individuals might be urged to attend, or if need be, assisted financially so they might attend a college or university in this or some other state. It was believed that all young people graduating from Indiana high schools who really possess superior native mental endowment should be encouraged and helped to continue their education beyond the high school stage.

2. It was also believed that a reliable intelligence rating would greatly aid deans and college faculties in directing and supervising the educational work of their freshman students. It is an indisputable fact that students with superior mental ability often do only average or inferior work in college while students of meager or inferior ability are often expected by their instructors to do a superior grade of work. To give college authorities help along this line, high school principals were asked to have the intelligence score made by each senior student recorded on their permanent school records, and sent with his scholarship standing to the college authorities if he expected to attend college, or sent to his employer if he expected to go to work. In this way, college authorities would know the grade of work which might reasonably be expected from their freshman students, and the

giving of a mental examination to all high school seniors before graduation instead of to those who actually present themselves for admission to college would enable us to locate, select, and encourage those with superior intelligence. The purpose and advantage of this plan was carefully explained to each senior class when the tests were given.

3. It was also thought that a reliable intelligence rating would be of assistance to school and college faculties in giving their students wiser vocational direction. A reliable intelligence score is perhaps the best single criterion we have for determining the life career for which a student should prepare. The grade and type of general intelligence and training that is required for success in the more important occupations is rapidly being determined by testing those who have made or who are making a success in these fields of work. These *norms* when compared with the scores which high school or college students make on a reliable mental test constitute, it is believed, the first necessary step in giving young people the *educational* and *vocational* guidance which they need to make their education and life work truly efficient.

4. Lastly, it was desired to determine by reliable intelligence tests any differences which might exist in the native mental endowment of the seniors coming from different high schools in the state. Schemes for high school inspection and accreditment for college entrance have in general assumed that high schools located in every part of the state should measure up to the same standards of efficiency and achievement regardless of the mental endowment of their students. One of the purposes of this study was to ascertain to what extent the individual high schools of the state were alike or different in this regard and to acquaint teachers and school officials with any inequalities in the native mental endowment of their students which might be found to exist.

II. MATERIALS AND METHODS

1. Intelligence Scale Used

The battery of tests used in this survey was the Indiana University Intelligence Scale, Schedule D, worked out in the psychological laboratory of Indiana University by Dr. and Mrs. Pressey, research assistants in the department of psychology. This mental examination consisted of 10 separate tests of 20 items each:[1] (1) a test for rote memory, (2) logical selection, (3) general arithmetical ability, (4) opposites, (5) logical memory, (6) word completion, (7) moral classification, (8) dissected sentences, (9) practical information, and (10) analogies. This series of tests had been previously verified both as to its reliability as a scale for measuring general intelligence and as a practical instrument for making such a mental survey as was proposed in the present study.[2] It had previous to this investigation, May, 1919, been used in a survey of the school population of an entire Indiana county, and had been given to all the pupils in 3 Indiana cities, and to more than 10,000 high school and grade pupils in Illinois, Colorado, North Dakota, and New York.

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[1] For a detailed description of this series of mental tests, see article by S. L. Pressey, Jr., in *Applied Pyschology*, Vol. 2, September, 1918, pp. 250–269; and study by W. F. Book, "Variations in Mental Ability and its Distribution among the School Population of an Indiana County", *Proceedings* of Fifth Annual Conference on Educational Measurements, *Bulletin of the Extension Division*, Vol. IV, pp. 100–131, April, 1919, published by Indiana University.

[2] *Journal of Applied Psychology*, September, 1918, Vol. 2, pp. 250–269.

The tests were given exactly as contained in the official Indiana University scale, except that the time allotted to each test was reduced to adapt them to high school seniors, and that the first five items on Test I (rote memory) and Test III (arithmetical ability) were omitted.[3] These items were so easy for high school seniors that they would merely consume time for both pupils and scorers. This reduced the total score that could be made on the tests to 190 points instead of 200, as in the original scale.

The blanks were also adapted in certain other respects in order to obtain information from the pupils and teachers which would enable us to study the intelligence of these students in relation to certain social, economic, and educational conditions which we thought important. To this end information was obtained on the following points: (1) the age of the student at the time of graduation, (2) the number of semesters spent in high school, (3) college intention of the student, whether or not he expected to attend a college next year, and the name and kind of college selected, (4) yearly income of the father, (5) the father's occupation, (6) the pupil's favorite subject in high school, (7) pupil's choice of a life occupation, if made, (8) the student's scholastic standing in high school in all subjects for the junior year, etc. This information was obtained by teachers from the school records and by having the pupils answer immediately before and after the mental examination was given certain questions printed on the test blank. Arrangements were also made with the principal or teacher giving the examination to check each of these items on the test blanks and on the official report of the examination sent to the State Board of Education to insure its correctness. Each report was signed by the teacher or principal who gave the examination and graded the papers, and by the school official who certified to the correctness of the final report. The original test papers were also returned with these reports for verification and study.

2. Method of Giving the Tests

The test blanks were sent out by Mr. O. H. Williams, at that time state high school inspector for Indiana, from the office of the State Superintendent of Public Instruction, Indianapolis, to the principal or teacher who, in response to a previous letter, had indicated his interest in the proposed study and his willingness to coöperate by giving these tests. A printed examiner's guide was sent to the teacher or principal giving the examination. This manual contained instructions to teachers on the general purpose of the experiment, on the giving of intelligence tests, and on the exact procedure to follow in arranging for and giving the tests. It also contained the explicit directions to be given to pupils in each test, how to obtain from the pupils the general information called for on the blanks, and a complete set of rules for scoring the papers and for making out the special reports to be sent to the State Board of Education, under whose general authority and direction this investigation was made.

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[3] These changes in time and omission of the items mentioned would so modify the scores made on the tests that the results obtained in this examination cannot be compared with the results obtained from the use of our official schedule D.

This final report was made on a special blank which contained the name of each pupil taking the examination, his record for each individual test, his total score, age at graduation, number of semesters spent in high school, average scholarship record during his junior year in high school, father's occupation, father's annual income, college intention,[4] choice of a life occupation, favorite study in high school, etc. This made it possible to make comparisons between these several items and the intelligence score made by each pupil. It also provided an opportunity to verify and check the correctness of each item in the reports from individual schools, inasmuc has the original test papers, together with all information called for, were returned to the State Board of Education for reference and verification by the investigators.

The tests were all given during the early part of May, 1919, and were given to all senior students of a school on the same day. Because of the delay in arranging for the investigation thru the State Board of Education, the blanks did not reach some schools in time for them to give the examination before commencement. Many small schools had closed before the blanks reached them, but 320 commissioned high schools in the state gave the examination to their senior classes, which varied in size from 2 to 276 pupils. There were in these high schools a total of 6,188 senior students who took the examination—2,477 boys and 3,711 girls. In a few schools the entire senior class was not present on the day the tests were given, but from about 98 per cent of these schools a 100 per cent record was obtained from their senior classes.[5] Two large and 3 small high schools did not return their reports in time to have them included in all our comparisons. Their results were included only in our comparisons of communities and schools and in getting our state standard. For all other comparisons reports from 5,748 students were used, 2,306 boys and 3,442 girls.

3. Scope of the Findings and Results

As may be inferred from this description of method, results were obtained in this investigation, bearing on the following 14 topics or problems, which will serve as sectional headings in the final report:

(1). Intelligence of Indiana high school seniors.
Shown by the range in score made on our mental tests.

(2). Intelligence of the seniors going to college.
Obtained by making a comparative study of the scores made by the seniors (*a*) going to college, (*b*) those not going to college, (*c*) those going to a liberal arts college, (*d*) those going to a professional or technical college, (*e*) those going to college, with no college selected.

(3). Intelligence of seniors belonging to different occupational groups.
Obtained by distributing the intelligence scores of our total

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[4] In the column calling for the college intention of each pupil the teacher or principal making out the report was asked to write the name of the particular college the pupil expected to attend if a choice had been made, the word "yes" if he was going to college, but had not made a choice of his college; the word "no" if he stated he did not expect to go to college. All this information was contained on the pupil's mental test blank and was verified by the experimenters.

[5] A check on this point was obtained by having each school report the total enrollment of its senior class and the number of boys and girls who took the examination.

group according to the occupations of their fathers and comparing and contrasting with our state standard the intelligence ratings made by seniors belonging to each of these several occupational groups.

(4). Intelligence of seniors coming from different economic classes, i.e. relation between intelligence of high school seniors and the economic status of their parents.

Obtained by redistributing all our seniors into groups according to the earnings of their fathers and comparing the intelligence scores of those belonging to different economic levels.

(5). Intelligence of seniors selecting different occupational careers.

Obtained by distributing our total group on the basis of the life occupations selected and comparing (*a*) the score made by the group who had selected a life occupation with the group that had not; and (*b*) comparing and contrasting the scores made by the groups selecting different standard occupations.

(6). Intelligence of seniors pursuing different courses in high school—general, scientific, classical, college preparatory, vocational, etc.

Obtained by comparing the intelligence rating of the seniors pursuing each of the seven courses offered in the 320 high schools tested.

(7). Extent to which these high school seniors have prepared in high school and are definitely planning to prepare in college for the occupations selected.

Shown by comparing their choice of occupation with their college intention, selection of a college, their favorite study in high school, high school course, etc.

(8). Intelligence of seniors who had been accelerated and retarded in high school.

Obtained by comparing and contrasting the intelligence scores of those requiring 6, 7, 8, 9, 10, 11, or 12 semesters to complete a four-year high school course.

(9). Intelligence of seniors who had been accelerated or retarded in the grades or high school from 1 to 3 years.

Obtained by comparing the records made on our tests by those who graduated from high school when they were 15, 16, 17, 18, 19, 20, to 27 years of age.

(10). Intelligence of seniors coming from different communities and schools.

Obtained by comparing the intelligence ratings of the seniors coming (*a*) from different sections of the state, i.e. the northern, central, and southern parts of the state; (*b*) those coming from different sized high schools in each section; (*c*) those coming from different types of community, e.g. a mining, agricultural manufacturing, and urban community; (*d*) those coming from schools situated in a fertile or barren section; (*e*) comparing the records made by the seniors from individual schools of the, same size and located in the same county or section of the state.

(11). Geographical distribution of the seniors possessing the most superior intelligence.

Shown by a map indicating the location of the schools possessing the ablest 1 per cent of all seniors tested.

(12). Intelligence of seniors selecting different subjects as their favorite study in high school.

Each senior taking the examination was asked to indicate his favorite subject in high school. The records made on our tests by those electing different subjects were compared with each other and with our state standard.

(13). Relation between intelligence and school success.

The average record made by each student in his junior year in high school was correlated with his mental test score.

(14). Sex differences shown by all these comparisons.

The records made by the boys and girls on our tests were kept separate in all our tabulations and revealed some very significant differences in regard to all these points, particularly on problems 1, 5, 7, 8, 9, and 13.

The results on some of these topics bear directly on the problem of locating and selecting the most intelligent seniors. The results of other sections give data which show to what extent our high schools and colleges are making provisions for the location and care of students with superior mental endowment. Still other sections bear more directly on the problem of giving suitable vocational and educational direction; others give data which reveal the inequalities in mental strength of senior classes in high schools located in different sections of the state. But for the sake of clearness and directness the results will be presented in our final report as mentioned above. In Section IV, of the final report to be published separately, devoted to a discussion of results and conclusions, these four aims of the survey will be discussed in the light of all our facts.

In this report we can present the data on only 2 or 3 of the 14 divisions of the study, and we shall make no attempt to draw conclusions except in regard to the divisions of the survey presented in this report. Most, if not all, of the 14 divisions would be of interest to this group of superintendents and teachers. It has, therefore, been difficult to select the 2 or 3 problems which would probably interest you most. We have selected the following: (1) The intelligence of Indiana high school seniors, the section giving us our state standards and norms, (2) the intelligence of the seniors expecting to go to college, (3) provisions made by our high schools and colleges to locate and provide for seniors possessing superior mental endowment.

III. RESULTS

1. Intelligence of Indiana High School Seniors

The first problem of this study was to ascertain by reliable measurement: (1) the average level of intelligence found among high school seniors in Indiana, (2) the variations in intelligence which occurred among the members of this group or grades of mental endowment which this selected group of young people possessed, and (3) the relative frequency with which these various grades of intelligence were found among the individuals of this special group.

(*a*) *General Level of Intelligence of High School Seniors.* Since it is impossible to measure absolute intelligence because we do not have and cannot get an actual zero point to start from, and since any group of individuals reveal many different grades of mental ability, the general level of intelligence of any group must be measured by standards obtained from the group itself or by standards obtained from other groups of individuals whose intelligence rating is known. High school seniors represent a highly selected group of individuals who have, to my knowledge, not been tested as a whole. We, therefore, do not have norms from a similar group of adults with which to compare our results. Neither do we have norms for our scale from an unselected group of adults. The most reliable index of the average level of intelligence of this special group of individuals will, therefore, be the central tendency or median score for the total group, and the range in score for the middle 50 per cent which indicates not merely the median for the group, but the middle points in the distribution of scores above and below this middle point.

The median score for our entire group was 137 points out of a possible score of 190. The median score for the boys was 138.8 and for the girls 135.8. The total range in score extended from 40 to 187 points. The middle 50 per cent of the group made scores on the tests ranging from 124 to 148 points. (See distribution curves, Figure 1 below.)

(*b*) *Range of Intelligence.* The different grades of intelligence which our group of high school seniors possessed is indicated by the range in score *above* and *below* the central tendency for the total group, and by the distribution of the scores *above* and *below* the central point. Table I, containing the percentile scores for the entire group and for both sexes, shows that while the median score is 137, 50 per cent of the pupils make scores between 124 and 148 points, 10 per cent make scores above 158, the highest 5 per cent made scores above 164, while the highest 1 per cent made scores ranging from 176 to 187 points. The poorest 10 per cent of the total group made scores below 111 points, the lowest 5 per cent fell below 102, while the lowest 1 per cent made scores ranging from 40 to 81 points.

TABLE I. PERCENTILE SCORES FOR 6,188 HIGH SCHOOL SENIORS

Percentile Groups	1	5	10	20	25	40	50	60	75	80	90	95	99
Score for boys. . .	80	102	112	122	126	134	139	143	150	153	160	165	177
Score for total group.	81	102	111	121	124	131	137	142	148	151	158	164	176
Score for girls. . . .	83	101	110	120	123	131	136	141	147	150	157	163	175

A clearer, and perhaps more accurate, idea of the different grades of mental ability possessed by this selected group of high school students may be obtained by ascertaining the percentage of individuals whose test scores placed them in definite sectors of the total distribution. If we divide the total range of scores, *above* and *below* the median, into sectors of equal length and calculate the percentage of individuals whose test scores place them at these different levels of the total distribution, we get an indication not merely of the different *grades* of intelligence which our total group possessed, but obtain a method which will enable us to measure the *relative frequency* with which each of these grades occur in our total group. If then some specific label or name be assigned to each of these sectors in our total distribution, we have a method which enables us to compare any group of individuals we wish with our state standard, and to ascertain the extent to which these same grades of intelligence occur in any particular grouping which we may desire to make of these same individuals. We may also determine the relative frequency with which these different grades of ability occur in a given group and so draw definite conclusions in regard to their presence or absence and relative frequency in any reclassified group which we may wish to compare with our state standard.

In order to get such a workable basis for evaluating the different grades of intelligence possessed by our total group and a method which would enable us to compare the several groupings of these same individuals which we wished particularly to study in this investigation, we divided the total range in score made by our total group into steps representing an increase or decrease in score of 10 points *above* or *below* the median score for the total group. A distribution curve drawn on this basis is shown in Figure 1 and indicates the relative frequency with which each grade of ability occurred in our total group. To make all necessary calculations and comparisons easy and possible we considered the middle sector (135 to 139 inclusive, 2 points on either side of the median) as a separate unit, and made regular gradations above and below this middle point. (See Figure 1 below.)

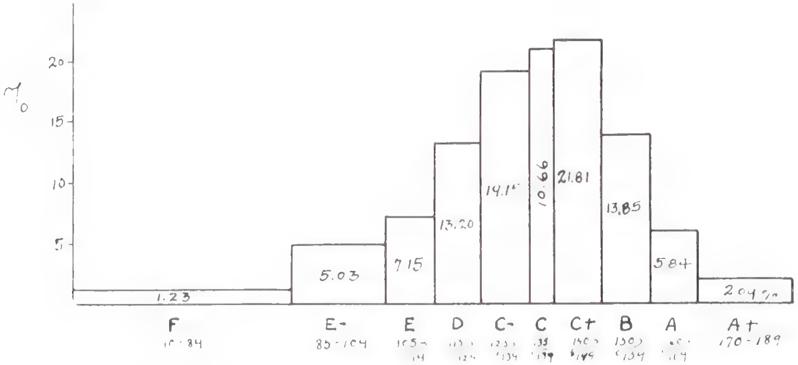

FIGURE 1. Distribution of Grades of Intelligence for Total or Standard Group

It will be noted from an inspection of this distribution curve that the range in score extends farther *below* than *above* the median point. The steps in our total distribution are for sake of clearness and ease of comparison designated by the letters A+, A, B, C+, C, C–, D, E, E–, and F, beginning with the highest sector or rank and continuing to the lowest. The score values of these steps and their relative frequency in our total group is shown in Fig. 1. In the remaining sections of this report these variations in test scores, represented here by these letters, will, for the sake of convenience and ease of comparison, be referred to as A, B, C, D, E, or F grades of ability, signifying the variations in intelligence suggested by these differences in total score.

As may readily be seen, the steps in this distribution curve, above and below the median point, are of equal length until the highest and lowest ranges are reached. But it must not be inferred that these various sectors in the curve indicate an equal amount of increase or decrease in general intelligence. Our scale is not nor cannot be so constructed as to give equal value to each of these sectors. The absolute value of these different grades of mental ability is unknown. But, notwithstanding this fact, we may give them a label and make definite comparisons with regard to the *presence* or *frequency* of any or all of these grades of intelligence in any particular regrouping of these same individuals which we may desire to make. This method not only gives us a tentative state standard for our measurements, but a means for making convenient and reliable comparisons between all groups of seniors which we desired to study in this experiment.

(*c*) *Number of Pupils at the Various Mental Levels.* To determine the relative frequency with which these different grades of intelligence occur among the individuals in any group, we need only to ascertain the percentage of individuals belonging to the group whose test score placed them in standard sectors of the total distribution. The relative frequency of these different grades of intelligence for our total group are shown in Figure 1 and Table II.

TABLE II. DISTRIBUTION OF DIFFERENT GRADES OF INTELLIGENCE

Grades of intelligence or mental rating..........................	A+	A	B	C+	C	C−	D	E	E−	F
Per cent of total group who earned each grade on the test..........	2	6	14	22	11	19	13	7	5	1

(*d*) *Probable Value of Each of These Grades of Intelligence.* The real significance of these grades of intelligence may be inferred if translated into terms which are applicable to a large group of unselected adults. Such grades of mental ability, following the nomenclature used in the army tests,[6] may be designated as follows: (1) *very superior*, or A grade of intelligence; (2) *superior*, B grade of intelligence; *high average*, C+ grade; (4) *average*, C grade; (5) *low average*, C– intelligence; (6) *inferior*, D grade; (7) *very inferior*, or E grade of intelligence, depending upon the position in which the individual's mental test score placed him in the total range of scores. We may further assume, as has been determined by actual experiment, that individuals with *very inferior* mental ability, the lowest 8 or 10 per cent of such an unselected group of adults are mentally deficient, or border-line cases, belonging to the higher grades of the feeble-minded, who have not been committed to an institution for the mentally deficient. Those with *inferior* intelligence, the next 15 per cent, we are told, are rarely able to go beyond the third or fourth grade in our elementary schools, no matter how long they attend. Individuals with a *low average* or C— grade of intelligence may possibly finish the elementary school grades, but rarely if ever go on to high school. This leaves for the high school only the individuals who possess *average* (C), *high average* (C +), *superior* (B), and *very superior* or (A) grades of intelligence. Since those with only average intelligence are rarely capable of completing a high school course, we may conclude that the high school *seniors* whom we tested would belong, in the main, to the high average, superior, and very superior groups, if measured by a standard obtained from a large group of unselected adults. Those who made scores on our tests which place them in the lowest 5 or 10 percentile group would, therefore, possess (because they are seniors in high school) at least *average* intelligence if measured by a standard obtained from an unselected group of adults.

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[6] Army Mental Tests, Washington, D.C., November, 1918, pp. 5–7.

The various grades of intelligence possessed by our high school seniors must, therefore, be thought of as further variations of these higher rankings of unselected adults.

It would be helpful if we had norms for our scale from such an unselected group of adults with which to make our comparisons, or better still, if we had an absolute scale for measuring native mental ability so that we could determine where in this scale of absolute values our group would stand, between the lowest, or zero grade of intelligence, and the highest possible grade. But since this is clearly impossible we can make comparisons in this report only in terms of standards obtained from our own *selected* group, remembering the probable position in a normal scale of distribution which this group occupies, and what the inequalities in mental ability possessed by this group probably mean when translated into terms of a normal distribution. And since our group is composed exclusively of those who have successfully completed a high school course, we may infer that we tested only a few adults with *average* intelligence, and possibly only the *best* of the group possessing *high average* intelligence. The rest of our seniors, if thought of in terms of a standard obtained from an unselected group of adults, would doubtless possess *superior* and *very superior* intelligence.

It should, therefore, be clearly borne in mind, in considering the results of this study, that the individuals in our group whose test score places them in the highest sectors of our distribution, represent in all probability the *very best* individuals intellectually of what in a normal distribution would be classed as a *superior* group. This much is certain. They are the best of this original group of *superiors* so far as the high school is able to *select* and *conserve* them. *It is this highly selected and in all probability specially gifted group that we wished to locate by means of this investigation and to assist by encouraging them to continue their education beyond the high school stage.*

Our first problem was to locate these specially gifted individuals and to ascertain what per cent of them were definitely planning to continue their education in a college or university. As will be shown in certain sections of the study, such superior students are located in every section of the state, in the small as well as in the larger high schools, among all economic and occupational groups, in the country as well as in the city, in the barren as well as the fertile regions of the state. They have not been located and taken care of by the high school and college as their special endowment would seem to demand.

2. Intelligence of High School Seniors Going to College

a. VARIOUS GROUPS COMPARED

One of the chief problems of this study was to determine to what extent our colleges and universities now draw the ablest students graduating from our high schools. To get a measure of the native mental endowment of the high school seniors going to college and those not going, each student who took the tests was requested to indicate his college intention, if any. The results of the tests were then tabulated in such a way that a direct comparison could be made between the scores made by the seniors who said they were definitely planning to attend a college or university and the scores made by those who stated that they would not do so. We also compared the scores made by the students who had decided to attend an engineering or professional school with the scores made by the group who had selected a college of liberal arts, and both these groups with the group who expected to attend college, but who had not definitely selected the kind of college they expected to attend. The mental tests given to all classes of men in the army showed that engineers rated distinctly higher on the mental tests than did any other single group. We desired, therefore, to ascertain whether the brightest students graduating from Indiana high schools were planning to attend a professional or technical school, or planning to go to a college of liberal arts.

(1) *The General Level of Intelligence of Seniors Belonging to each of These Groups.* The general level of mental ability possessed by each of these groups when compared with our state standard, or average of our total group, is indicated by the percentage of individuals belonging to the group who made a score on the tests above the state median. (Compare Table III.) It will be seen that the group expecting to attend college ranks above the group which will not attend and that the seniors who have selected the college they will attend rank highest, and that those who expect to attend a professional or technical school rank ahead of all the groups.

TABLE III. PER CENT MAKING SCORES ABOVE THE STATE MEDIAN

Groups Compared	Will attend college	Will not attend college	Will attend college of liberal arts	Will attend technical school	No college selected	Cases
Sexes combined....	51.74	46.41	57.02	58.98	47.10	5748
Boys...............	56.07	47.47	59.02	59.49	51.92	2306
Girls...............	48.37	45.91	55.92	53.34	44.93	3442

A better indication, perhaps, may be obtained of the general level of intelligence of these various groups from Figure 2 which compares the record made by the middle 50 per cent of seniors belonging to each group with our state standard. The position of the middle 50 per cent of our total or standard group is indicated by the shaded part of the scale at the top of the figure. The scale at the bottom, A to F, shows the score value of the various intelligence ratings. The horizontal bars indicate the record made on our tests by the middle 50 per cent of the various groups being compared. The vertical line crossing each bar indicates the median score for the group.

As may be seen from an inspection of this figure, the median score and middle 50 per cent of the group going to college ranks slightly higher than the group not going to college, the latter ranking slightly lower on both points than our standard or total group. The group planning to attend a liberal arts college ranks ahead of all other groups, while the group expecting to attend college, but who have not definitely selected the college they would attend, ranks lower than our total or standard group.

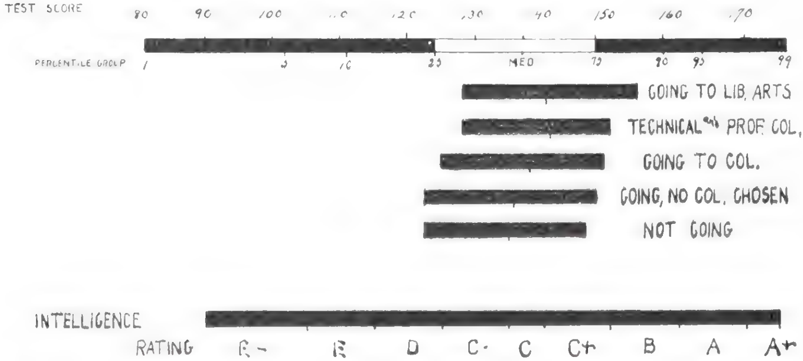

FIGURE 2. Scores obtained by middle 50 per cent of the seniors (1) going to college, (2) not going to college, (3) going to liberal arts college, (4) going to professional or technical college, and (5) going to college, but with no college selected.

(2) *Relative Frequency of Different Grades of Ability Among the Individuals Belonging to Each of These Groups.* This is shown by Figures 3 to 6. Figure 3 gives the percentile curves for (1) all students who expect to attend a liberal arts college, (2) those going to college, but who have not decided what college they will attend, and (3) those not going to a college or university. The curves indicate the scores which a definite proportion of the students in each group made on our tests, i.e. the 1, 5, 10, 25, 40, 50, etc., percentile groups. It will be seen that the students going to college are slightly superior at all levels of ability to the group that will not attend. Those who have selected a college of liberal arts average higher at every level of the distribution than either of the other groups. The curve for the group expecting to attend a professional or technical school is not shown in the figure. If drawn it would pass between the upper and middle curves. It will also be noted that the curve for the group which had not decided what college or kind of university to attend is a little below, in the lower sectors of the distribution, the curve for the group who will not attend college. In the upper sectors of the distribution it rises above this curve. This is doubtless due to the fact that there are girls in this group getting very low scores who said they were going to college, when they meant a business college.

Figure 4 compares the various grades of ability possessed by the group going to a liberal arts college with the grades of ability possessed by the group not going to college. It will be seen from these curves that the group going to a liberal arts college is distinctly superior to the group not going to college with regard to the per cent of individuals rated A+, A, or B, and that the group not going to college has a larger proportion of individuals rated D, E, and F. This is shown by the fact that for the higher levels of ability the curve for the group expecting to attend a liberal arts college rises above the other curves, while for the lower levels of ability the curve for the group not expecting to attend college rises above the liberal arts curve. The curves for those who had not decided what college they would attend and those who expected to attend a professional or technical school are not shown in the figure. If drawn they would pass between the two curves shown in the figure.

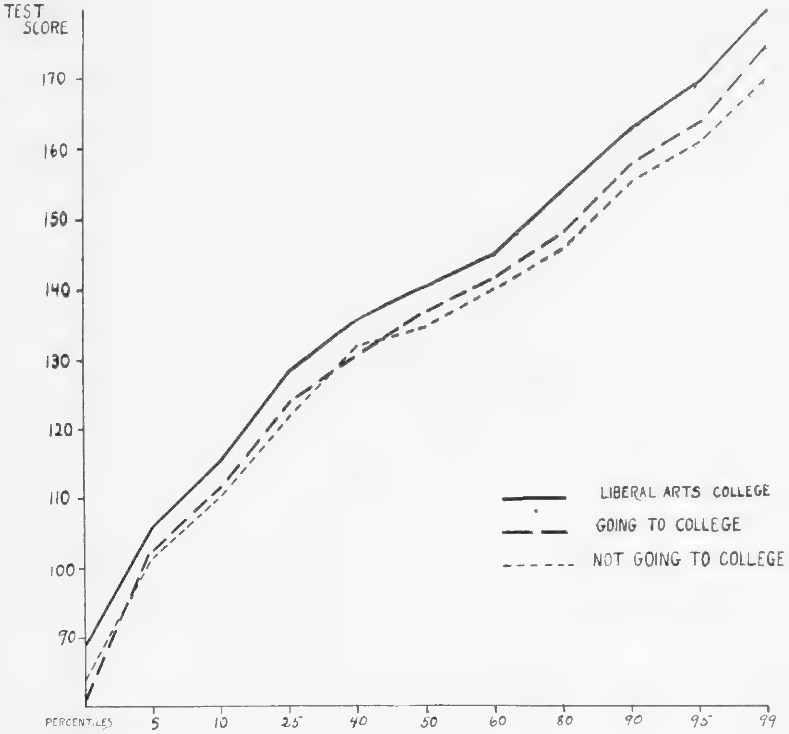

FIGURE 3. Curves showing scores obtained by various proportionate (percentile) groups of seniors: (1) those going to college, (2) those going to college of liberal arts, (3) those not going to college.

Figure 5 compares the grades of intelligence possessed by the group going to a liberal arts college with that of the group going to a professional

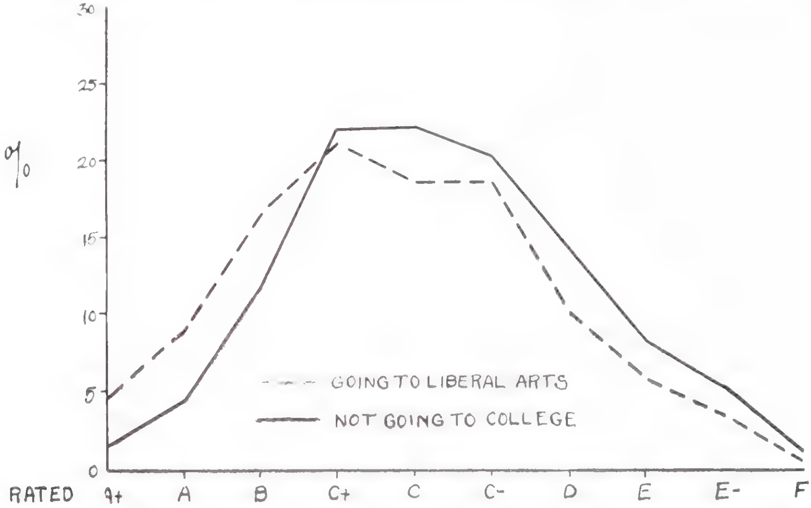

FIGURE 4. Frequency curves, showing percentage of seniors: (1) not going to college, and (2) going to liberal arts college who possess each grade of intelligence, A+ to F, represented in our total or standard group.

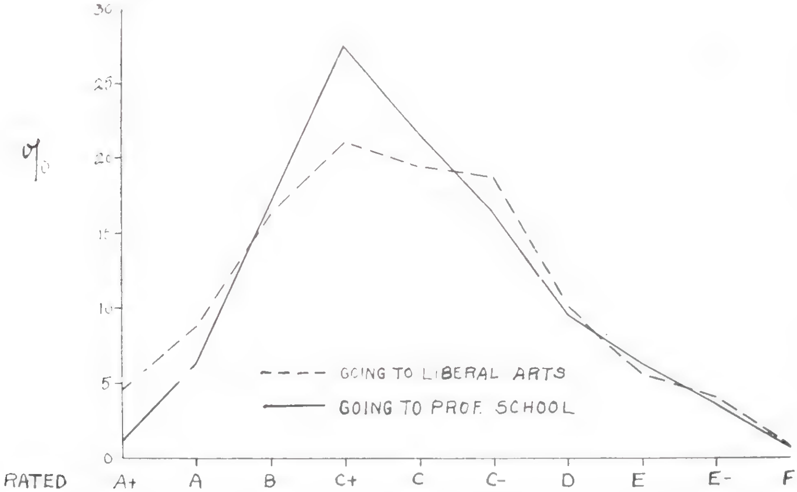

FIGURE 5. Frequency curves showing the percentage of individuals going: (1) to liberal arts colleges, (2) to professional or technical schools who possess each grade of intelligence.

or technical school. A glance at these curves shows the superiority of the liberal arts group for all higher grades of mental ability. The curve for the liberal arts group rises above the curve for the technical group at the points indicating an A + or A grade of ability. But for the C + and C grades of ability the curve for the technical group rises far above the curve for the liberal arts group, which means that a larger percentage of individuals

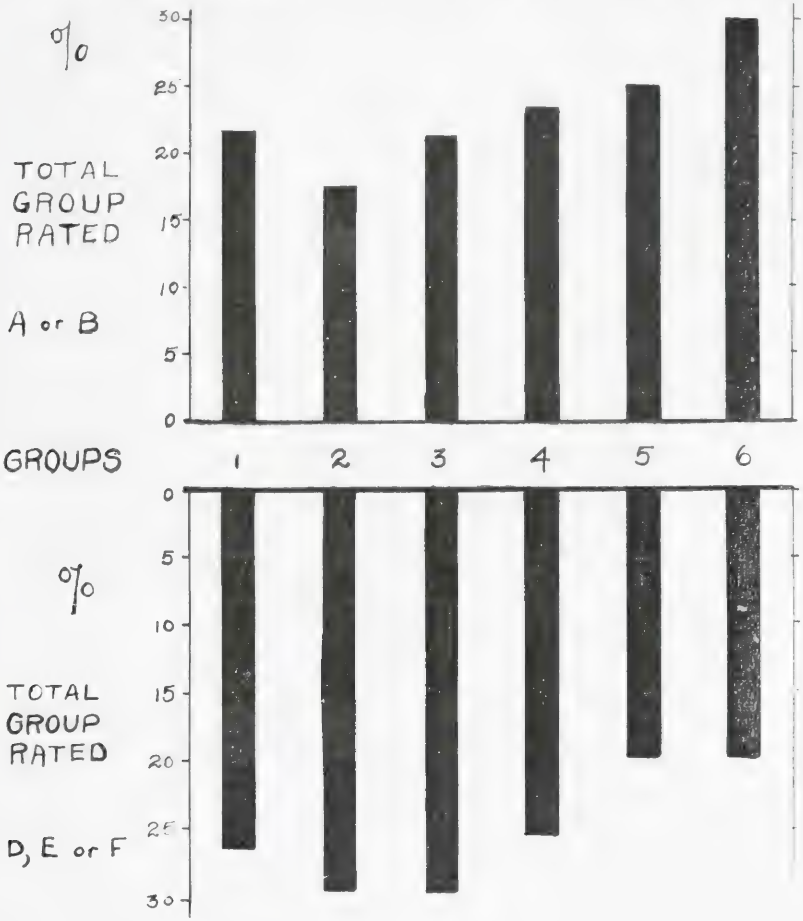

Figure 6. Percentage of seniors possessing the highest (A or B) and lowest (D, E, or F) grades of intelligence in the following groups: (1) our total or standard group, (2) those who do not expect to attend college, (3) those expecting to attend college, no college selected, (4) all who intend to attend college, (5) those intending to go to a technical school, (6) those selecting a college of liberal arts.

belonging to the latter group possess these grades of ability. It is this fact which makes the per cent of individuals belonging to this group making scores above the state median, higher than for the liberal arts group. (Compare Table III.)

From these curves it appears that students possessing the higher grades of ability are slightly more likely to attend college than students possessing only average or inferior mental endowment. This fact is shown in a striking way by Figure 6, which pictures the per cent of seniors rated A or B and D, E, or F belonging to each of these groups. Each of our 5 groups is compared in this figure with our state standard and with each other in regard to the proportion of students belonging to each group who were rated A or B and D, E, or F. Group 1 represents our state standard; 2 represents the group which will not attend college; 3 is the group expecting to go to college, with no college selected; 4 contains all who expect to attend a college or university (groups 2 and 4 take in all individuals tested); 5 the group selecting a technical or professional school; 6 the group who will attend a college of liberal arts. Figure 7 shows sex differences for each of these groups.

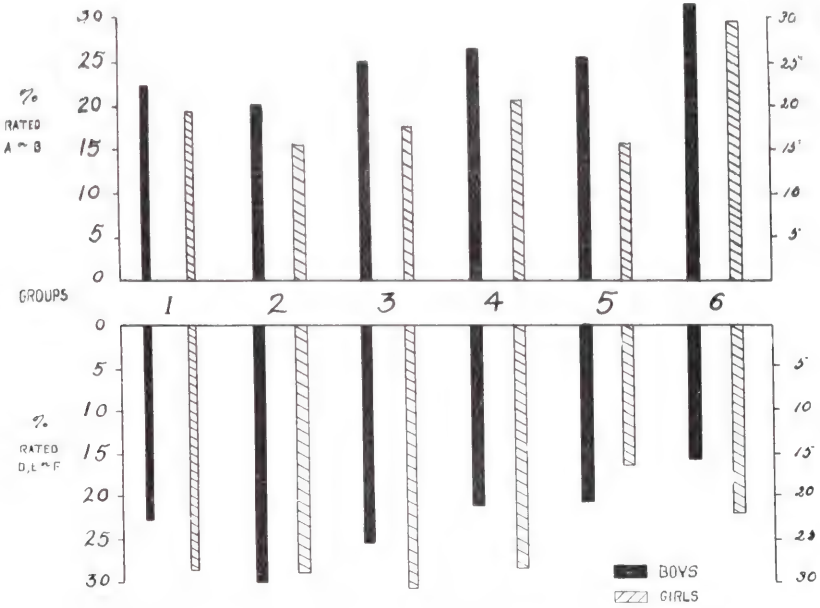

FIGURE 7. Groups compared in Figure 6 distributed according to sex.

These results clearly show that the brighter students are more likely to attend college than those of mediocre or inferior mental ability, and that the brightest students are more likely to go to colleges of liberal arts. But the very significant fact that there are about as many individuals of mediocre and inferior intelligence going to college as students rated A or B is not brought out by these results.

This fact is shown in a striking way by Figure 8. Figures 6 and 7 have already shown that a large percentage of the individuals not going to college are rated A or B and the corresponding fact that there are almost as many individuals rated D, E, or F in the groups going to college, as seniors possessing the higher grades of intelligence.

Figure 8 pictures the per cent of students in our total group possessing each grade of ability (A + to F) who are (1) going to college, no college selected; (2) going to a liberal arts college; (3) going to a professional or technical school; (4) the percentage not going to college. A mere glance at this figure will reveal the rather startling fact that 22 per cent of all students rated A + are not planning to go to college at all, not even thinking about it. Of the students rated A, 24 per cent are not going to college, that of those rated B and C +, 28 and 33 per cent respectively do not intend to go to college. While 71 per cent of the students rated F, 68 per cent of the total group rated E—, 62 per cent of the group rated E, and 64 per cent of the group rated D are definitely planning to attend a college or university as soon as they graduate from high school. Many of these students had their college already selected, as is shown by the shadings in the figure.

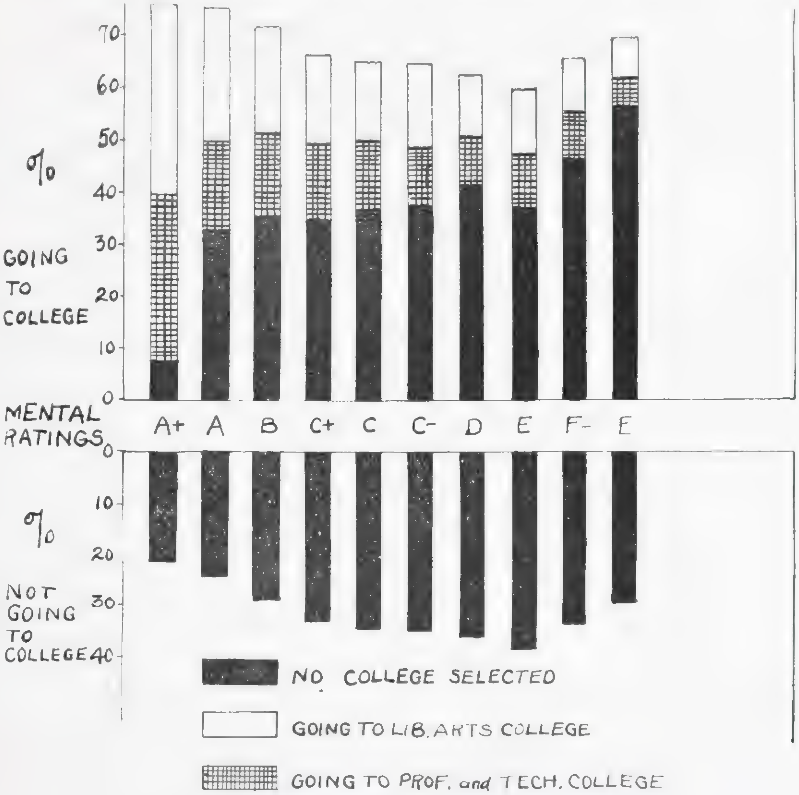

FIGURE 8. College intention of high school seniors possessing each grade of intelligence, A + to F, who are (1) going to college, (2) going to college, no college selected, (3) going to a liberal arts college, (4) going to a professional or technical school, and (5) not going to college at all.

The kind of a college which the seniors will attend who possess each grade of ability is indicated by the different styles of shading in the bars representing the group. (Compare Figure 8).

b. GENERAL SUMMARY OF FACTS

The outstanding facts revealed by this comparison of the intelligence rating of these several groups of seniors are the following:

1. High school seniors with all grades of intelligence possessed by high school seniors from the lowest to the highest are going to college in about equal numbers. Almost as many students with an intelligence rating of E and F are going to college as those ranking A+ or A.

2. Many of the brightest students graduating from our high schools are, on the other hand, *not planning* to go to college at all. Of those rated A+, 22 per cent stated they never expected to attend a college or university. Of those rated A, 24 per cent did not intend to continue their education beyond the high school. Of those rated B, 28 per cent did not expect to continue their education beyond the high school stage.

3. Many students, on the other hand, whose test scores placed them in the lowest intelligence ranks are definitely planning to go to college, many having already selected the college they expect to attend. Of those ranking D and E, 64 and 62 per cent respectively stated that they would attend college next year. The kind of college which these students expected to attend is indicated by the shadings in Figure 8.

4. On the whole, the students who have decided to go to college ranked slightly higher on our tests than those who had not. Those selecting a college of liberal arts rank higher than any other group. Those who have selected a definite college to attend rank consistently higher than those who have not decided where to go.

5. The brighter students, those rated A+, A, or B, are slightly more likely to go to college than those whose test scores place them in the middle or lower intelligence ranks. (Compare Figures 4, 5, and 8.)

6. The more intelligent the students the more likely they are to have selected their college, and to attend a college of liberal arts. A larger proportion of students rated A+ or A select a college of liberal arts while more students rated C+ and C are planning to go to a professional or technical school, as may be seen by the crossing of the curves in Figure 5. This fact makes the per cent of the latter group who make scores above the state median slightly higher than the per cent for the liberal arts group.

7. For every level or grade of intelligence the boys rank higher than the girls. These differences hold for all groupings made in this section. The higher the grade of intelligence the greater is the percentage of boys. (Compare Figure 7.) For other figures and tables dealing with sex differences see following sections and divisions devoted to sex differences.

c. EDUCATIONAL IMPLICATIONS OF THESE FACTS

(1) *Some Needed Readjustments in Present College Practices.* From the facts revealed in this section it is clear that students of almost every grade of native mental endowment possessed by high school seniors enter our colleges and universities each year. Moreover, there are about as many individuals of the mediocre grades of intelligence who go to college as possess

the most superior grades. What quality of work should we expect from college students who vary so greatly in mental endowment, and how may intelligence tests and reliable mental ratings assist college authorities in giving to these young people the educational direction and guidance which they need?

If, as we may assume, individuals possessing a superior grade of mental ability, when measured by a standard obtained from a normal or average group, are capable of making a good record in college, we may safely conclude that any high school senior who makes a score above the median or average score for our total group is capable, so far as native mental ability is concerned, of doing good work in college. If he makes a score very far *above* this middle point in our standard, we may conclude that he has the mental ability to do *superior* work as a freshman in college and should be expected to do so.

But since our results clearly show that high school seniors of all grades of ability are planning to attend college in about equal numbers, we must conclude that many individuals will attend college who cannot do average or first-class work unless the standards are adjusted to the level of ability of such students as attend. College authorities and instructors should not expect the same quality or amount of work from students who vary so greatly in native mental endowment. They should, on the other hand, use the knowledge which has been obtained concerning these differences in intelligence and adjust their work accordingly. One of two things must be done. If high school seniors of all grades of intelligence are admitted to our colleges and definitely encouraged to attend, as is now the case, some arrangements should be made for grouping these students into classes or sections of equal mental strength so that the problem of instruction might be facilitated and the superior students given the kind of opportunity and assistance which their special ability demands.

If, on the other hand, the chief function of our universities is, as many believe, to train leaders for society in all lines of human activity, special provisions should be made to locate these specially gifted individuals, and to provide the means for their further education in the right sort of a college or university, and the work in these colleges conducted in a way that would be most helpful to them.

(2) *The Practical Value of a Mental Survey of High School Seniors.* This study has shown that about 25 per cent of the students possessing the highest grades of intelligence found among high school seniors are not even thinking about attending college, while about 65 per cent of those possessing the lowest grades of mental ability are definitely planning to attend. What can be done to encourage and help the former class to make the most of their native capacities and talents and to direct the latter group in a way that will enable them to find the work in life which is best suited to their native mental strength? It may be questioned whether those with only average or meager mental endowment should be definitely discouraged from attending a college or university, but everyone, I think, would agree that all who possess superior intelligence should be definitely located and given whatever help and encouragement is needed to have them continue their education until they are properly and fully trained. In the solution of this problem a mental survey of high schools may prove of definite practical value.

1. Such a state-wide mental survey of high school seniors would enable us to locate this superior group of young people and would prepare the way for giving them the encouragement and help they need to continue their education in a college or university.

2. A little experimentation in coöperation with the colleges and universities would doubtless, also, reveal a point on our scale below which students should be definitely discouraged from entering a university. The scholastic record made by last year's senior students now attending the colleges of the state is being investigated and correlated with the scores made on our mental tests. The next problem to attack is to establish a point on this and perhaps other reliable intelligence scales below which high school students should be definitely discouraged from entering college.

3. Such a mental survey might also be extended downwards to the seventh and eighth grades, to ascertain whether our high schools are attracting and the grades conserving the brightest pupils. It may be that children with the best native mental endowment are, for financial or other reasons, not entering our *high schools.* The facts should be determined and proper adjustments made.

4. Such a mental survey, if continued over a period of three or four years, would also reveal, as nothing else could, the true character of the human resources of the state—our most vital asset.

5. Such systematic surveys would also reveal in time why students with superior intelligence do only average or mediocre work in school and often fail in life. If such surveys were followed up we would soon get in the habit of not expecting the most superior grades of work from students possessing only inferior or average intelligence and would begin to adapt our schools and work more to the inequalities in mental endowment found among our pupils.

6. Lastly, such surveys are needed if we would give young people the right sort of educational and vocational guidance while they are being trained for the duties of life. One of the greatest social wastes today is due to the fact that so many men and women, because of present economic conditions, or lack of proper direction, are engaged in occupations far beneath their level of ability, while others are attempting work too complex for their native endowment. Both groups are made unhappy and inefficient because of the ill adjustment. In our educational work we are also ignoring most of these facts. Much of our work is general and too aimless to be effective, and a bad matter is made worse when we attempt to train young people in professional or vocational schools for careers wholly unsuited to their native mental strength. Systematic mental surveys would do much to correct such social wastes, and if such surveys were made of the workers now engaged in standard occupations they would reveal the level of intelligence which successful workers in every field actually possess. This would provide norms which would give us a starting-point at least for the effective vocational and educational guidance of youth.

3. Provisions Made in High Schools for Differences in Intelligence Among Pupils

For purposes of economy in training and in order that all grades of ability and training might be fully conserved, the various companies and divisions in our late army were organized as far as possible on the basis of equal mental strength. In education, too, we have come to see that if we would facilitate the problem of learning and training and fully conserve the native abilities of our pupils, all inequalities in mental endowment must be taken into account. For this reason we were interested, in this study, to ascertain to what extent the high schools of the state were actually adapting themselves to any mental differences in student material which our study might reveal. When we collected information with regard to the age of each senior at time of graduation, the number of semesters he had spent in completing a four-year high school course, his scholarship record during his junior year, etc., we had such questions as the following in mind: Do our high schools take proper care of their brightest students? Do they make adequate provisions for their special advancement? Are the ablest pupils really located and permitted to continue their work as rapidly as they can and should? Are some students advanced more rapidly than their ability really warrants? If a student is failing in his work, i.e. spending ten or twelve semesters in high school before he satisfactorily completes his course, does this mean that he is naturally dull or simply that the high school has failed to reach and interest him? One of the problems of this study was to ascertain as nearly as we could the exact situation in Indiana high schools in these respects.

a. NUMBER OF STUDENTS ACCELERATED, RETARDED, AND NORMALLY ADVANCED BY THE SCHOOL

We were interested, first of all, to know whether there were as many pupils in the senior classes of Indiana high schools who had been accelerated, retarded, and normally advanced in school as the inequalities in intelligence revealed by this study would lead us to expect. The number of pupils accelerated or retarded during their high school course and the number normally advanced is shown by the number of semesters each student spent in completing his high school course. Some completed a four-year course in six semesters, others required ten or twelve semesters to graduate. Most seniors completed the course in normal time, or eight semesters. The exact situation with regard to the seniors who took our mental tests is shown in Table IV which gives the per cent of seniors who were (1) accelerated in high school, (2) the per cent who were retarded, and (3) the per cent who were normal in their high school placement, as judged by this criterion. If they graduated in six or seven semesters we counted them accelerated; if they required nine or more semesters to complete a four-year course they were judged retarded; if they graduated in eight semesters they were considered normal or regularly advanced in high school.

TABLE IV. PER CENT OF SENIORS WITH ACCELERATED, RETARDED, AND NORMAL STANDING IN HIGH SCHOOL

	Boys	Girls	Sexes Combined
Per cent accelerated (graduating in 6 or 7 semesters)	5.5	6.13	5.85
Per cent retarded (graduating in 9 to 12 semesters)	4.5	3.28	3.78
Per cent with normal standing (graduating in 8 semesters) . .	90.00	90.60	90.34
Total cases	2,306	3,442	5,748

TABLE V. SAME RESULTS AS GIVEN IN TABLE IV, DISTRIBUTED BY SEMESTERS

Per cent completing the High School Course in	Boys	Girls	Sexes Combined
6 semesters	.91	1.28	1.13
7 semesters	4.59	4.85	4.73
8 semesters	90.00	90.60	90.34
9 semesters	2.86	2.35	2.58
10 semesters	1.48	.90	1.13
11–12 semesters	.17	.02	.09
Total cases	2,306	3,442	5,748

Table VI shows the per cent of students *retarded* or accelerated at some time during their entire school course; also the proportion of seniors who had been regularly advanced. For purposes of comparison we considered that a senior had normal school standing thruout the high school and grades if he had completed the work of the eight grades and four years of high school in twelve years, having entered school when he was six years old. This would make him 18 when he graduated from high school. Those seniors, therefore, who graduated at 15, 16, or 17 were counted as accelerated in their total school standing from 1 to 3 years. Those graduating when they were 19, 20, 21, 22 or more years of age were counted as retarded 1 to 4 years[7]. Where or how the time was lost we cannot tell.

TABLE VI. PER CENT OF SENIORS ACCELERATED, RETARDED, AND NORMALLY ADVANCED BY THE SCHOOL

	Boys	Girls	Sexes Combined
Normal Group			
Per cent completing high school at age of 18	39.4	40.1	39.85
Accelerated Group			
Per cent completing high school at age of 15, 16, or 17	40.2	43.2	42.01
Retarded Group			
Per cent completing high school at age of 19 to 23	20.3	16.6	18.14

TABLE VII. TOTAL ACCELERATES, NORMALS, AND RETARDS DISTRIBUTED BY AGE

Per Cent Completing High School at Age of	Boys	Girls	Sexes Combined
15	.57	.46	.51
16	7.20	6.93	7.04
17	32.38	35.81	34.45
18	39.40	40.10	39.85
19	16.08	13.45	14.68
20 to 27	4.25	2.92	3.46
Total cases	2,306	3,442	5,748

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[7] This does not, of course, take into account the fact that many of the students accelerated one or more years in their school standing may have been taught at home before starting to school and so gained a grade or two outside of school, or that others may have lost a year or more on account of illness. It is believed, however, that the method gives us a fair measure of the amount of retardation and acceleration which occurred among the group of students tested.

b. NUMBER OF SENIORS WITH SUPERIOR, AVERAGE, AND INFERIOR INTELLIGENCE

The percentage of students who made superior, average, and inferior ratings on our mental tests is shown in Table VIII. A mental rating of A+ or A indicates that the group possesses *very superior* intelligence for high school seniors; B indicates *superior* intelligence; C+ or C and C— that they possess *high average*, *average*, and *low average* intelligence; D or E indicates a *low* or *inferior* grade of mental ability; E— or F indicates *very inferior* ability for a high school senior.

TABLE VIII. GRADES OF INTELLIGENCE POSSESSED BY HIGH SCHOOL SENIORS

	Superior			Average			Inferior			
Mental ratings	A+	A	B	C+	C	C−	D	E	E−	F
Per cent of total group possessing each grade of intelligence	2	6	14	22	11	19	13	7	5	1

According to this method of ranking, 22 per cent of all seniors tested possessed very superior or superior intelligence for high school seniors, i.e. were rated A+, A, or B, 52 per cent possessed only average intelligence, and 26 per cent possessed inferior or very inferior mental ability for high school seniors. It, therefore, appears that there were fewer students retarded in their total school standing than were ranked D, E, or F on our tests. Only 20.3 per cent of the boys and 16.6 per cent of the girls were retarded, while 26 per cent ranked D, E, or F on our tests. On the other hand, there were more students accelerated one or more years in their total school standing than were ranked A or B on our tests. Of the total group, 42 per cent giving information on this point had saved one or more years during their entire school course by double promotion or other means, while only 22 per cent earned a grade of A or B on our mental test. If we add the students belonging to the C+ group (most of the students accelerated in high school made scores on our mental tests which gave them a "B or C+" rating) we get a percentage figure which practically equals the number that were advanced in school more rapidly than normal. Of our total group, 42 per cent were accelerated at some time during their school course. Of these same seniors, 44 per cent made scores on our mental tests which gave them an A, B, or C+ rating. About 40 per cent of our total group had been advanced normally thruout their school course according to this method of measurement, but only 30 per cent of the total group obtained a mental rating of C or C— on our mental tests. It, therefore, appears that most of our high average group (those ranked C+) have been accelerated at some time during their public school course while practically all of those rated D have been normally advanced.

We may conclude that the proportion of individuals who have been accelerated, retarded, and normally advanced by the schools corresponds at least roughly to the per cent who received mental ratings which placed them in the superior, average, or inferior intelligence groups.

But the figures for the high school proper are very different. Here 90 per cent have been normally advanced; and only 5.85 per cent have been accelerated, and 3.78 per cent have been retarded during their high school career. But of those who actually graduated last June, 22 per cent made an A or B rating on our mental tests, only 5.85 per cent were advanced more rapidly than normal, 52 per cent were rated C+, C, or C− (high average, average, or low average) but 90 per cent were kept on the course a full four years. Again 26 per cent made a D, E, or F (inferior) rating, yet only 3.78 per cent were retarded in high school. *It would, therefore, appear that the high school is not adapting itself very successfully to the native mental endowment of its students.*

c. INTELLIGENCE RATING OF THE SENIORS ACCELERATED, RETARDED, AND NORMALLY ADVANCED BY THE SCHOOL

Our second problem was to try to determine whether our high schools were actually locating and promoting the brightest students, holding back or failing only such pupils as were below average in intelligence, and promoting *regularly* those whose intelligence was average when compared with the general level of ability of our total or standard group. To collect data which would bear directly on this problem, our tabulations were made in such a way that the scores made by each of these groups, those accelerated, retarded, and normally advanced by the schools could be separately determined and the grades of intelligence possessed by each group studied and compared with each other and with our state standard.

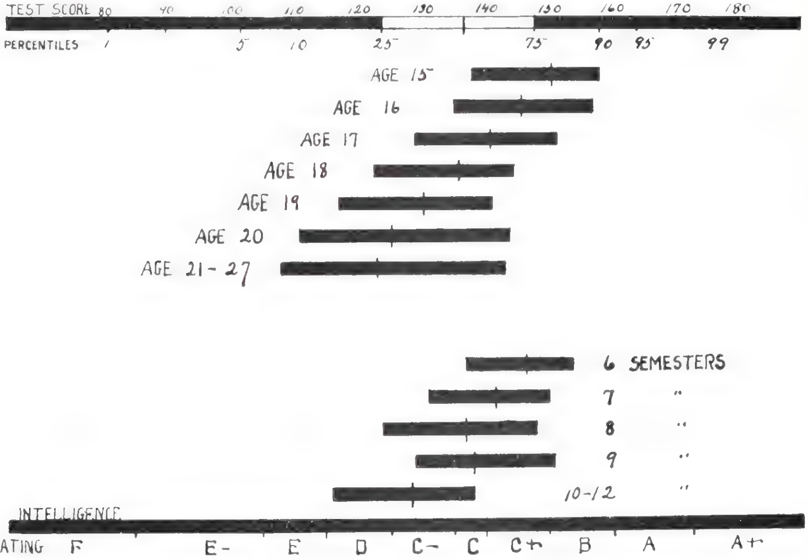

FIGURE 9. Scores obtained by middle 50 per cent of students graduating at age of 15 to 27, and in 6, 7, 8, 9, and 10 to 12 semesters. Horizontal bars show range in score of the middle 50 per cent of each group. The vertical line indicates the median score for each group.

Figure 9 compares the groups graduating in 6, 7, 8, 9, 10, 11, or 12 semesters with our state standard and with each other on the basis of central tendency. The figure pictures very clearly how far superior in central

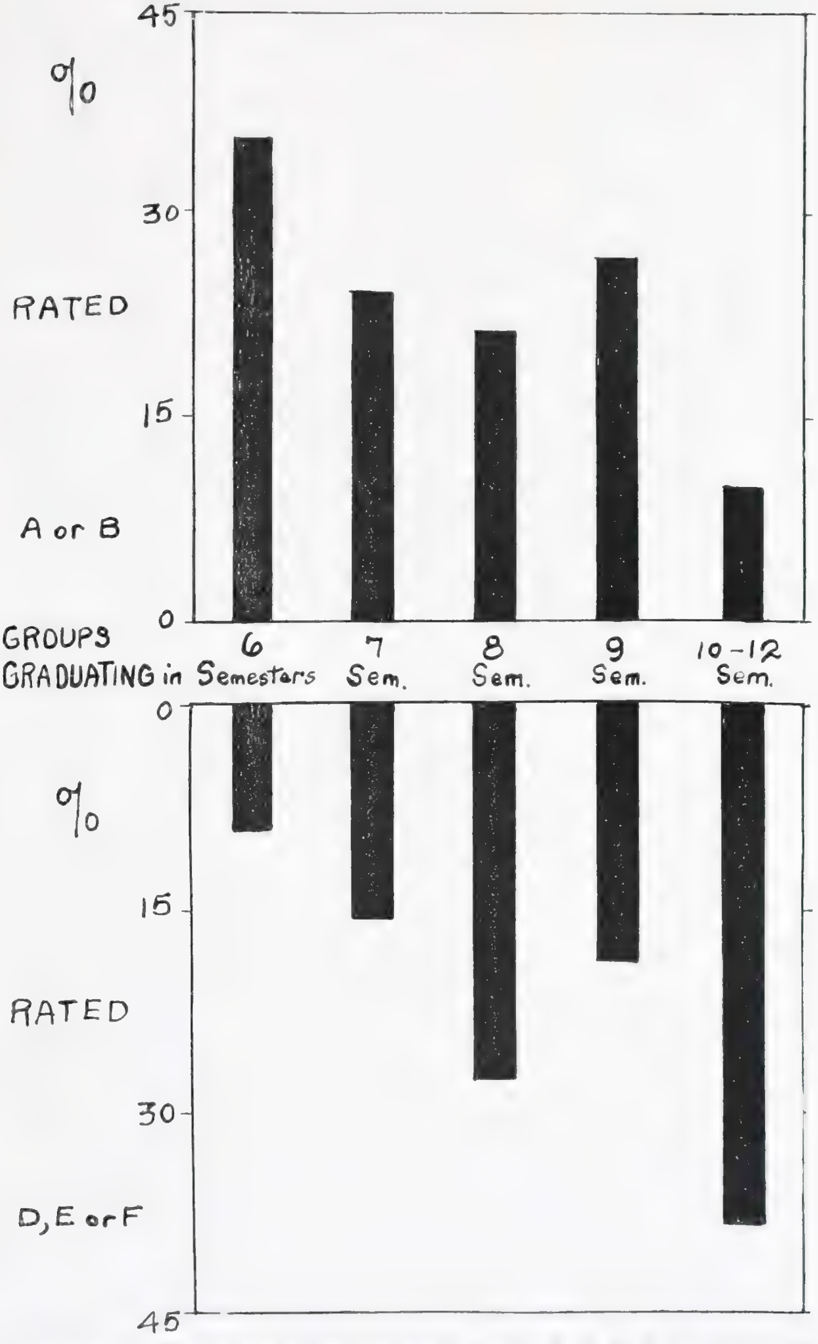

FIGURE 10. Percentage of seniors graduating in 6, 7, 8, 9, and 10 to 12 semesters who made the highest (A or B) and lowest (D, E, or F) intelligence rating on our tests.

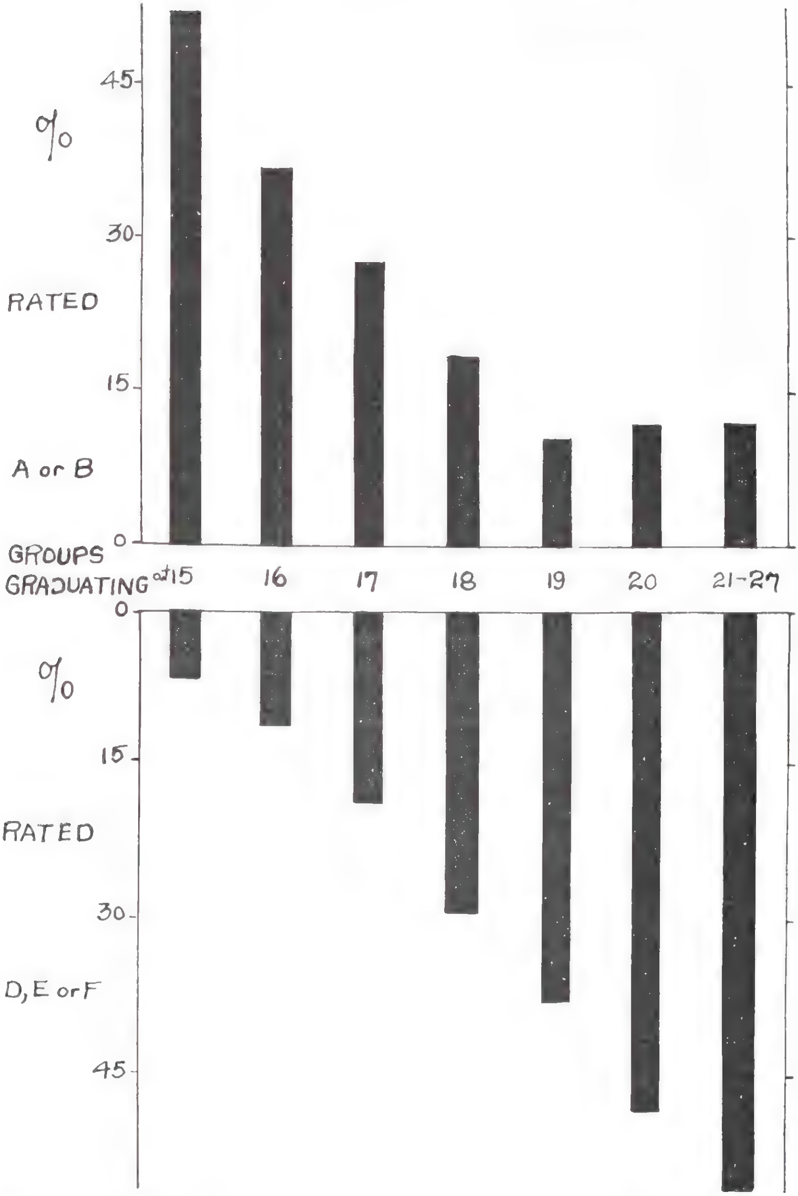

FIGURE 11. Percentage of seniors graduating at age of 15 to 21 who obtained the highest (A or B) and lowest (D, E, or F) intelligence rating on our tests.

tendency the groups of students are who completed their high school course in 6 or 7 semesters, and how far below the state standard the groups fall who were retarded in their high school standing one or more years, i.e. who graduated in 9, 10, 11, or 12 semesters.

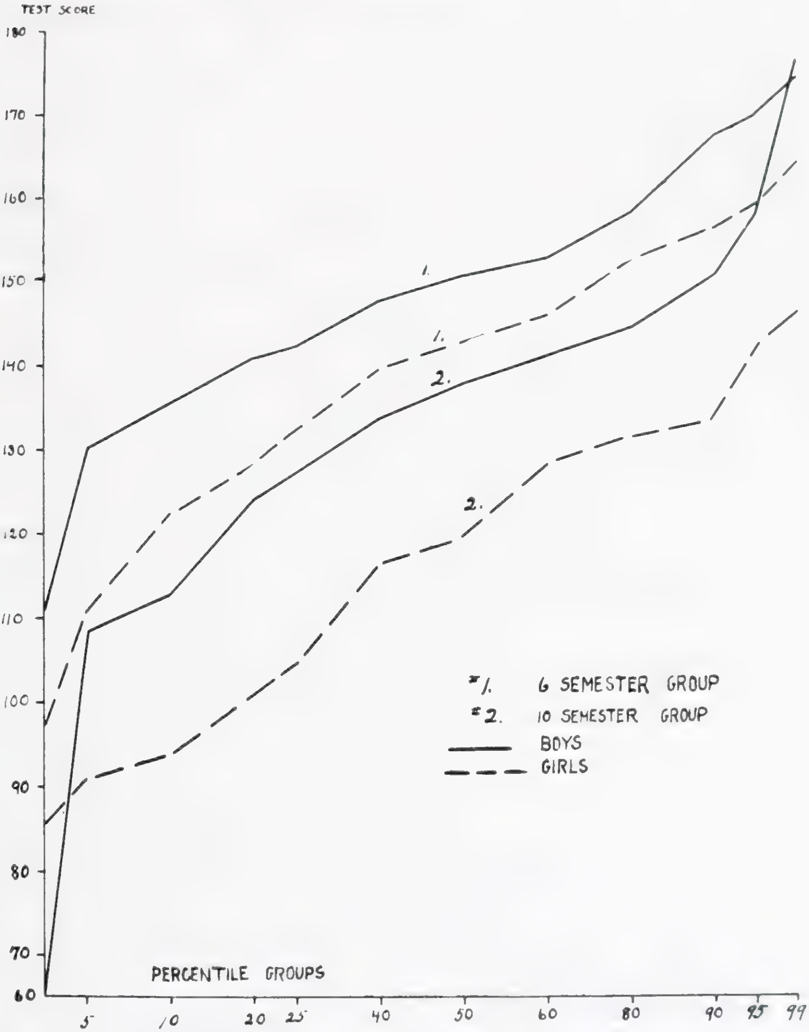

FIGURE 12. Curves showing scores obtained by various proportionate (percentile) groups of boys and girls graduating in 6 semesters from the high school, and graduating in 10 semesters.

Figure 10 shows the per cent of students belonging to each of these groups who possessed the highest and lowest grades of intelligence, i.e. those ranked A or B and D, E, or F on our tests. This comparison shows again the distinct superiority of the groups which have been advanced more rapidly than normal in high school. Except for semester 9 there is a regular gradation downwards from the group graduating in 6 semesters to the group requiring 10 or 12 semesters to complete their course.

The same fact is shown if we compare seniors who have been accelerated or retarded from one to three years during their entire school course, with our state standard and with the group which has been regularly or normally advanced during their entire school course. The group graduating from high school at the age of 15 has a much larger percentage of students ranked

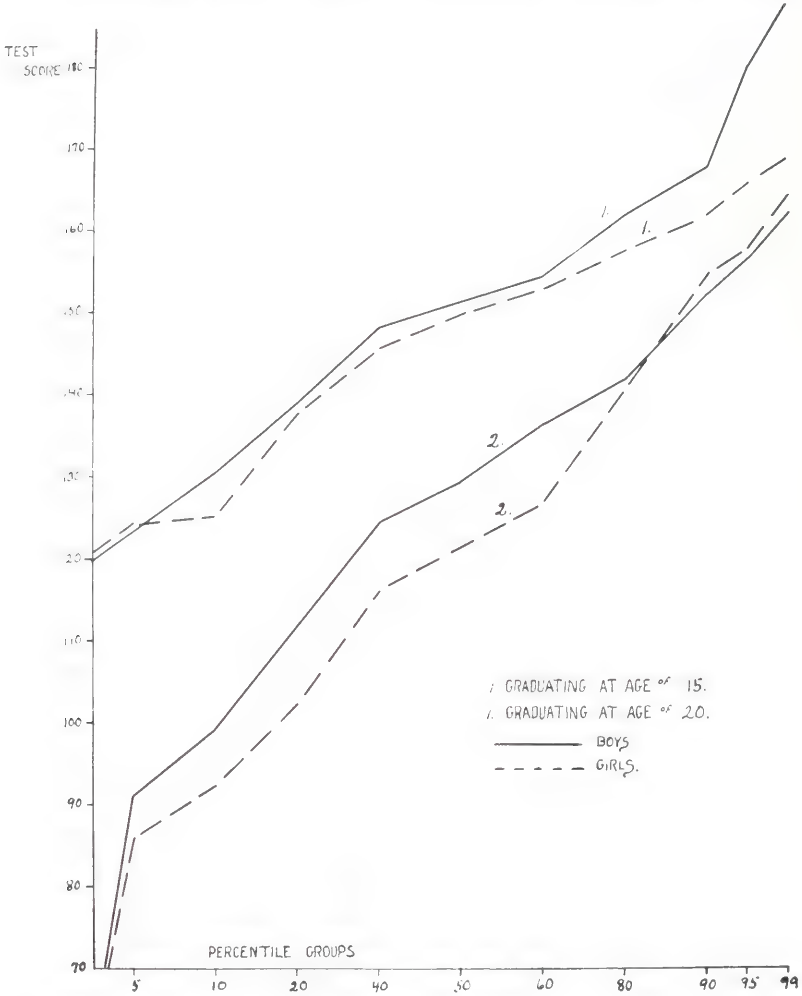

FIGURE 13. Curves showing scores made by the various percentile groups of boys and girls graduating at the age of 15 and 20 are shown on the vertical line. Percentile groups indicated along the base line.

A or B and a smaller percentage ranked D, E, or F than our total or standard group. It is also superior to the group graduating at 16, while the latter is superior in both these respects to the group graduating at 17 and so on down the list to the oldest or most retarded group. (Compare Figure 11 below.)

It should also be pointed out that the accelerated groups are superior at every level of ability as is clearly shown by the percentile curves shown in Figures 12 and 13. That is to say, those who do make scores which place them in the groups possessing the lower grades of mental ability don't fall quite so low on our tests as do the individuals belonging to the retarded group.

The proportion of the several age groups which possess each grade of intelligence, from A+ to F, is shown in Figures 14 and 15. Here we find again that the groups accelerated in their school standing rank higher on our tests than the individuals whose placement in school is normal or retarded

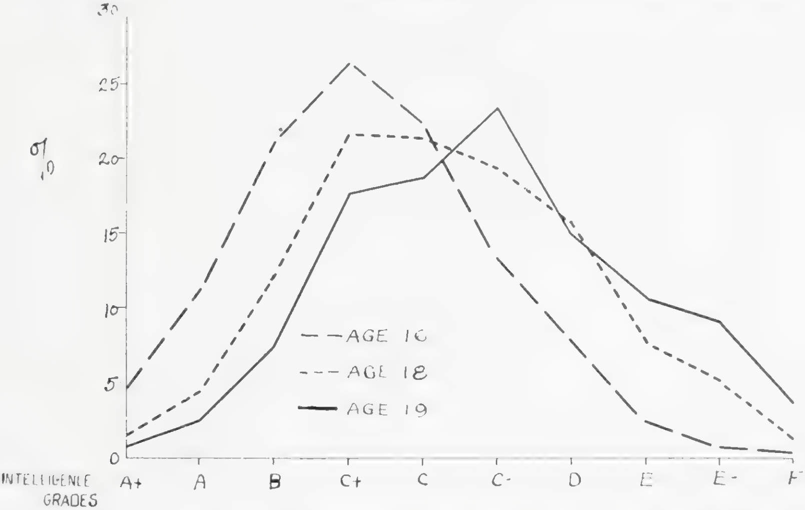

FIGURE 14. Frequency curves for seniors graduating when 16, 18, and 19 years of age, showing the percentage belonging to the group who possessed each grade of intelligence from A+ to F.

That is to say, the curves for the accelerated groups rise above the other curves at the points indicating an A or B grade of ability and pass below them at the points indicating a C−, D, E, or F grade. Figure 14 compares the group which has been accelerated one year in total school standing, with the group that was retarded a year in their total school course, and both these groups with the group that had been regularly promoted or normally advanced by the school. As may readily be seen from a glance at these curves, the group graduating at 16 is distinctly superior to both other groups in the percentage of individuals belonging to the group who possess the higher (A+, A, B, and C+) grades of ability. This curve is higher and lower at the points representing the higher and lower grades of ability, while the curve for the normal or average group passes between the other two curves at both these points.

Figure 15 shows the distribution of all grades of ability for the groups graduating at the age of 15 and 20 respectively. The striking feature of these curves is the large proportion of students graduating at 15 who possess only B intelligence and the correlative fact that the largest proportion of seniors graduating at the age of 20 possess only a C—, D, or E grade of mental ability.

These facts show pretty conclusively that the students who have been advanced by the schools more rapidly than normal are brighter than the average of our total or standard group, and that those failing of promotion possess only mediocre or inferior mental ability when compared with our state standard or total group. But the most significant facts revealed by our comparative study of these groups are not shown by the figures and tables presented thus far.

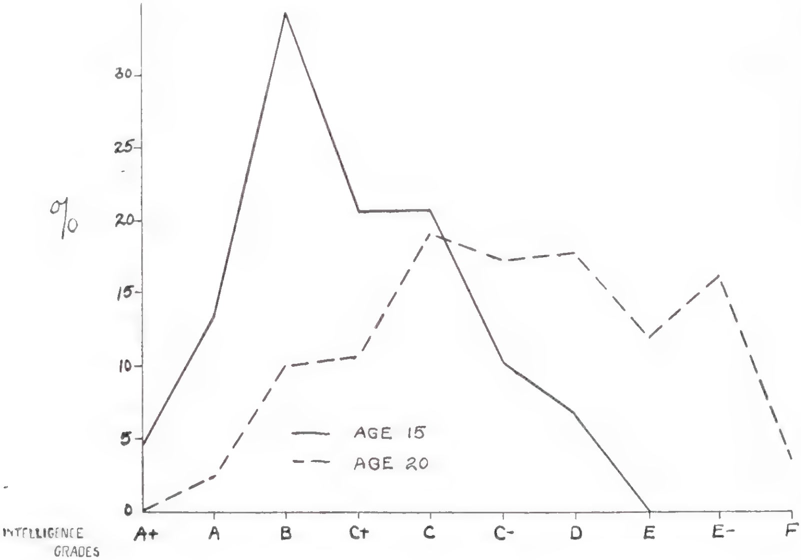

FIGURE 15. Frequency curves for seniors graduating at age of 15 and 20, showing the percentage belonging to each group who possessed each grade of intelligence from A+ to F.

A study of our distribution tables for these several age and semester groups revealed the very significant fact that none of the brightest seniors in last year's graduating classes were found among any of the groups of pupils who had been advanced more rapidly than normal by the schools, but were always found in the group that had been only regularly promoted by the high school. A large proportion of these brightest seniors were even found in the group that had been only normally advanced thruout their entire school course. That is to say, neither in the high school nor in the grades were these brightest students (if we may trust the results of our mental tests) located and doubly promoted. These distribution tables also revealed the fact that some seniors who had been accelerated from 1 to 3 years in their school standing possessed only a mediocre and sometimes an inferior grade of mental ability, as judged by the scores made on our mental tests, while practically all of those specially advanced by the schools belonged to the group possessing only high average or a C+ grade of intelligence as has already been shown.

Table IX distributes all seniors on the basis of grade of intelligence possessed (A+ to F) into 3 groups: (1) those who were doubly promoted or specially advanced in high school, (2) the per cent who were normally advanced, (3) the per cent of the group who were retarded from 1 to 4 semesters in high school, and reveals the following rather startling facts:

1. Only about 6 and 7 per cent respectively of the seniors who possess an A+ or A grade of ability were advanced more rapidly than normal during their high school course. Of this same group of very superior students 91 and 89 per cent were normally advanced, i.e. were kept in high school 8 semesters to complete their course, while 3 and 4 per cent of the students rated A+ and A were retarded 1 or 4 semesters while completing their high school course.

2. What seems just as astounding and out of place is the fact that 3 per cent of the pupils rated E and 1½ per cent of the seniors rated F were accelerated one or more semesters in high school, while 93 and 97 per cent of those possessing these lowest grades of intelligence were regularly promoted in high school; and only 4 and 1½ per cent of the students receiving these lowest rankings on our intelligence tests were retarded one or more semesters during their high school course. (Compare Table IX.)

TABLE IX. GRADES OF INTELLIGENCE OF SENIORS ACCELERATED, RETARDED, AND REGULARLY PROMOTED BY THE HIGH SCHOOL

Mental Ratings	Per cent Accelerated	Per cent Retarded	Per cent Retarded
A+	5.83	90.83	3.34
A	7.14	88.69	4.16
B	7.28	88.94	3.76
C+	8.05	88.59	3.34
C	6.52	89.72	3.76
C−	5.36	90.08	4.55
D	3.68	92.75	3.55
E	2.92	93.43	3.65
E−	2.76	93.42	3.80
F	1.41	97.18	1.41

Table X compares the grades of intelligence possessed by the groups of seniors who have been (1) accelerated, (2) retarded, and (3) normally advanced thruout their entire school course. (Age group tables.)

TABLE X. PER CENT OF THOSE POSSESSING EACH GRADE OF INTELLIGENCE WHO HAVE BEEN ACCELERATED, RETARDED, AND REGULARLY PROMOTED IN BOTH THE HIGH AND ELEMENTARY SCHOOL

Grades of Intelligence	Per cent Accelerated	Per cent Regularly Promoted	Per cent Retarded	Total Cases
A +	66.67	28.45	4.87	120
A	60.91	30.61	8.48	336
B	53.70	35.30	11.00	796
C +	46.46	39.28	14.26	1,254
C	42.95	40.36	16.67	613
C −	37.69	40.71	21.59	1,099
D	30.90	46.03	22.95	759
E −	29.23	41.79	29.00	411
E	17.24	41.72	41.03	289
F −	24.26	26.09	49.28	71
Cases	2,392	2,268	1,088	5,748

Table XI shows the per cent belonging to each semester group possessing an A or B and a D, E, or F grade of intelligence. Those graduating in 6 or 7 semesters were regarded as accelerated in high school. Those graduating in 10 or more semesters were considered retarded. The group that had been regularly promoted or advanced in high school graduated in 8 semesters.

TABLE XI. DISTRIBUTION OF A OR B AND D, E, OR F GRADES OF INTELLIGENCE AMONG STUDENTS FINISHING THEIR HIGH SCHOOL COURSE IN 6, 7, 8, 9, 10, 11, OR 12 SEMESTERS

Per Cent of Total Group Rated	Number of Semesters Attendance Required to Graduate				
	6	7	8	9	10–12
A or B	35.37	24.15	21.44	27.14	10.75
D, E, or F	9.21	15.73	27.43	19.00	38.43

Table XII gives similar data for each age group. The fact of normality and the amount of acceleration or retardation in this case is indicated by the age of the pupils at time of graduation.

TABLE XII. DISTRIBUTION OF A OR B AND D, E, OR F GRADES OF INTELLIGENCE AMONG GROUPS GRADUATING AT 15 TO 27 YEARS OF AGE

Per Cent of Total Group Rated	Age at Graduation						
	15	16	17	18	19	20	21–27
A or B	51.71	37.14	27.82	18.37	10.75	12.68	12.72
D, E, or F	6.89	11.70	19.14	29.36	38.25	49.73	56.35

d. SEX DIFFERENCES

That the high school and to some extent the elementary schools are not adapting themselves as well to the interests and needs of the boys as the girls is suggested by a number of facts revealed in our results. Table XIII compares the boys and girls graduating from the high school in 6, 7, 8, 9, or 10 semesters with regard to the proportion belonging to each group who possess an A or B grade of intelligence and the lowest (D, E, or F) grade of mental ability.

As may readily be seen from an examination of the table, a much larger percentage of the boys accelerated in high school are rated A or B than girls, 53 and 33 per cent of the boys and only 27 and 19 per cent for the girls. This difference in favor of the boys is out of all proportion to the slight superiority in mental ability that has been shown by the boys thruout the study. The same superiority appears if we compare the per cent in each group making scores above the state median. This was 86 and 62 per cent respectively for the boys graduating in 6 and 7 semesters and only 66 and 60 per cent for the girls. The reason why the difference is less for the 7-semester group is due to the fact that this comparison includes all those who make a ranking of C+ or over on our tests.

This same point seems to be shown in a negative way by the fact that 20.58 per cent of the group of boys kept in high school 10 or more semesters to complete their course made an intelligence rating on our tests of A or B. Among the girls requiring an equal amount of time to complete their high school course none made a score on our mental tests which entitled them to an A or B intelligence rating, but 58 per cent of this same group of girls merited a rating of D, E, or F as against 20 per cent for the boys. (Compare Table XIII.)

TABLE XIII. INTELLIGENCE RATING OF THE BOYS AND GIRLS WHO HAVE BEEN ACCELERATED, RETARDED, AND NORMALLY ADVANCED BY THE HIGH SCHOOL

Groups Compared	Per Cent Rated A or B	Per Cent Rated D, E, F	Per Cent Above State Median	Scores Made by the Middle 50 Per Cent		
				25 Percentile	Median	75 Percentile
Boys						
6 semesters	52.37	4.76	86.00	147.36	150.50	156.25
7 semesters	33.01	16.04	62.00	131.45	142.72	152.13
8 semesters	24.24	24.76	53.00	125.13	138.47	149.63
9 semesters	28.80	16.67	53.50	128.43	138.33	152.50
10 semesters	20.58	20.58	50.00	126.87	137.50	144.07
Girls						
6 semesters	27.27	11.37	66.00	132.50	142.85	150.72
7 semesters	18.56	14.98	60.00	130.93	140.83	148.21
8 semesters	19.63	29.29	46.69	122.42	135.47	147.29
9 semesters	25.92	21.99	54.30	130.67	139.06	150.42
10 semesters	00.00	58.06	15.00	105.37	119.50	131.57

From a study of Table IV showing the per cent of boys and girls that were accelerated, retarded, and normally promoted in high school (already referred to above) it appears that the girls are as a rule more rapidly advanced in *high school* than the boys, notwithstanding the fact that the boys made distinctly higher scores on our intelligence tests. A slightly larger percentage of the girls have been accelerated in high school than boys (6.13 per cent of the girls and only 5.5 per cent of the boys) and conversely a smaller per cent of the girls have been retarded (3.28 per cent for the girls and 4.5 per cent of all the boys.)

If we take the figures for the entire 12 years of school, 43 per cent of all the girls have been advanced in school more rapidly than normal, while only 40 per cent of the boys have been accelerated and, as might be inferred from these figures, more boys than girls have been retarded. Of the boys, 20.3 per cent and only 16.6 per cent of the girls were retarded at some time during their entire school course. This is more in keeping with the results of the mental tests for the grades.[8] Below 14 years of age or in the elementary school grades the girls make better records on our mental tests than the boys, but in high school and after 14 years of age, the boys make better records than the girls.

The maladjustment would, therefore, seem to be in the high school. And we may conclude that the high school work is either better adapted to the interests and needs of the girls, or that the girls are more conscientious and persistent about their high school work, and therefore, more successful in their work; or that our tests were better adapted to the boys. That our tests are not better adapted to the boys than to the girls is shown conclusively by the fact that the same tests have been given to many thousands of school children in the junior high school and elementary grades in this and other states, and that in all these tests the girls made scores distinctly higher than the boys for every school grade or age up to about 14. We are not interested here in the probable cause of these sex differences in the elementary grades but in the fact that the boys tested in this study seem distinctly brighter than the girls while the girls, notwithstanding this fact, are advanced more rapidly in high school than the boys.

Sex curves were drawn for all the semester groups representing the per cent which possessed each grade of ability. These curves showed that the girls who remained in high school for 10 or more semesters were all much below average in mental ability. For example none of the girls who required 10 semesters to graduate made a mental rating above C. This entire group made scores which gave them a C −, D, E, or F intelligence rating. The case is quite different for the boys. The boys who spent 10 or more semesters in high school made scores on our mental tests which placed them at almost every level of mental ability. This would seem to argue that the high school work was not so well adapted to the needs and interests of the boys as the girls.

If further evidence were needed to establish this point it would appear in the fact that so large a percentage of the girls who finished their high school course in only 6 semesters made so low a rating on our mental tests. Of the girls graduating in six semesters, 11.37 per cent made a rating on our tests of D, E, or F, while only 4.76 per cent of the boys in the corresponding group were rated D, E, or F. Some reason other than native mental endowment must, it would seem, be found for the more rapid advancement of the girls.

That the chief difficulty or ill adjustment is in the high school rather than in the grades is indicated by the facts revealed in Tables XIII and XIV. Table XIV compares the sexes with regard to the per cent belonging to each age group who possess the higher (A or B) and lower (D, E, or F) grades of ability, also the per cent belonging to each group who made scores above the state median. By comparing the figures in Tables XIII and XIV it will be seen that the differences between the sexes are not so marked in

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[8] Compare one of our laboratory studies made by Mrs. S. L. Pressey, *Journal of Applied Psychology*, Vol. II, December, 1918, pp. 323–340.

Table XIV. The differences between the boys and the girls here approach very much more nearly the difference found between the sexes thruout this study, while the sex differences revealed in Table XIII cannot be so explained. Perhaps the most significant fact shown by Table XIV is the large percentage of girls in every age group, except 15, who were ranked D, E, or F. Notwithstanding this mental handicap, they were more rapidly advanced by the schools than the boys.

TABLE XIV. INTELLIGENCE OF BOYS AND GIRLS ACCELERATED, RETARDED, AND REGULARLY PROMOTED BY THE SCHOOLS

Ages	Per Cent Rated A or B	Per Cent Rated D, E, F	Per Cent Above State Median	Scores Made by the Middle 50 Per Cent		
				25 Percentile	Median	75 Percentile
Boys						
15..........	53.84	7.69	73.00	136.25	151.25	159.38
16..........	43.40	7.94	74.4	136.67	147.90	160.50
17..........	32.66	17.35	63.00	130.82	142.80	155.57
18..........	21.26	26.05	51.00	124.28	137.80	148.58
19..........	12.33	35.79	36.00	119.56	131.37	142.15
20..........	12.36	41.22	28.80	115.62	129.25	138.75
21–27......	6.89	51.71	34.50	107.00	123.50	141.11
Girls						
15..........	50.00	6.25	81.25	140.00	150.00	156.66
16..........	32.85	14.52	67.51	133.83	143.88	153.50
17..........	24.89	20.24	55.39	127.50	139.62	149.93
18..........	16.48	31.50	43.50	121.45	134.75	141.12
19..........	9.58	40.24	32.70	114.91	129.51	140.95
20..........	13.00	58.00	29.00	106.71	121.67	139.45
21–27......	19.00	61.53	30.70	110.50	122.50	142.50

e. SUMMARY

The facts revealed by this section may be summarized as follows:

1. The schools are succeeding to a certain extent in adapting their work to the inequalities in mental strength found among their students. The seniors who were advanced more rapidly than normal in both the high school and grades ranked consistently higher on our mental tests than did the seniors who were retarded or only normally advanced.

2. In this respect the high school does not seem to be succeeding as well as the elementary schools. Taking the schools as a whole, 42 per cent of the students tested in this study were accelerated at some time during their entire school course. In the high school only 5.85 per cent of our total group finished their high school course in less than 4 years.

3. The brightest seniors in our total list seem not to have been located by the schools at all, or if discovered they were not selected for special advancement either in the high school or grades. It was the seniors of high average and slightly superior intelligence that were advanced more rapidly than normal. None of the seniors who made a rating of A+ on our mental tests were found in any of the accelerated groups. These specially gifted individuals had either not been located by the school, or, if discovered, they were not permitted to complete their course in less than normal time. Those accelerated by the schools made a mental rating of only C+ or B on our mental tests.

4. The high school is advancing more rapidly than normal only a part of its ablest pupils. Taking the schools as a whole, 42 per cent of the seniors tested were accelerated at some time during their entire school course, 40 per cent were regularly promoted, and 18 per cent were retarded one or more years. In the high school, less than 6 per cent were accelerated, 90 per cent were normally advanced, and only about 4 per cent were retarded. But 22 per cent of these same students made scores on our mental tests which entitled them to an intelligence rating of A or B, 52 per cent made a rating of C+, C, or C—, 26 per cent made a rating of D, E, or F, —superior, average, or inferior intelligence for high school seniors.

5. The high school seems better adjusted to the interests and needs of the girls than the boys. The boys taken as a whole ranked decidedly higher on our mental tests than did the girls, but, notwithstanding this fact, the girls have been more rapidly promoted in high school than the boys.

6. The boys who were accelerated by the schools made decidedly higher scores on our tests than the girls so accelerated. Twice as many boys as girls who were accelerated by the schools made an intelligence rating of A or B. Many girls, on the other hand, with an inferior intelligence rating were accelerated. Of the girls graduating from the high school in 3 years 11.36 per cent made an intelligence rating of D, E, or F. Only 4.76 per cent of the boys graduating in 3 years fell so low on our tests.

7. The girls who were retarded in their high school standing 2 or more years possess, as a rule, inferior grades of intelligence as measured by our tests, whereas we found many isolated cases of boys with superior mental endowment who were retarded 2 or more years. Of the girls retarded in high school, 58 per cent made an intelligence rating of D, E, or F, and all the girls who were retarded made intelligence ratings below C+, while 20.58 per cent of the boys kept in high school 10 or more semesters to graduate made scores on our tests entitling them to an intelligence rating of A or B. If the girls were much retarded we might almost certainly conclude on the basis of our tests that they lacked the mental ability to do the work. This was not the case with the boys. For some reason the boys have not made as much of a success of their school work as the girls.

8. Many students (all boys) with superior intelligence have been retarded by the schools from 1 to 3 years. Other students (all girls) with inferior intelligence as high school seniors go, have been accelerated one or more years (compare Table XIII). And practically all the students who possessed the highest grades of intelligence possessed by high school seniors and who, therefore, should have materially shortened their high school course, were not encouraged or permitted to do so.

f. CONCLUSIONS

We may, therefore, conclude:

1. That the high schools of the state are not adapting themselves to the inequalities in mental strength shown by their pupils as well as they might. All the brightest students are not located and specially advanced Some with seemingly inferior mental ability are advanced at the normal rate along with the brightest. The seniors with the most superior intelligence are not located by the schools at all, or if located they are not permitted to shorten their course.

2. The high schools as at present organized and conducted seem to be better adapted to the interests and needs of the girls than the boys. The girls are more rapidly and consistently advanced by the schools, notwithstanding the fact that the boys make better records on our mental tests. This suggests that the high school is either better adapted to the interests and needs of the girls, or that the girls possess characteristics other than general intelligence important for school success not possessed by the boys. That our mental tests did not favor the boys is shown by the fact that when these same tests are given in the elementary grades the girls are consistent in making better scores on the tests than the boys.[9]

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[9] *Journal of Applied Psychology*, Vol. II, December, 1918, pp. 325-340.

The Relation of Intelligence to Achievement in the Second Grade

LUELLA COLE PRESSEY

I WISH first of all this morning to present to you certain tests and scales which we have recently developed for use in the first two grades, and then, in the second place, to show you by a concrete illustration certain uses to which such scales may be put in practical school work. And, since I take it you are much more interested in the practical values of the scales than in the details of their technical derivation, I shall spend most of my time on the last topic.

The results I have to show you were obtained with two scales, the Primer Scale and Scale of Attainment No. 1. The Primer Scale is a brief group scale for measuring general intelligence, for use in the first three grades. It was presented to you at the Conference a year ago. Since that time many of you have experimented with the tests—and most of you are familiar with the general nature of the examination. So no detailed description is necessary. I wish now only to mention that we have added materially to the norms available for this examination (norms which you will find in mimeographed form on the table at my right). And we have further investigated the validity and reliability of the examination. I may say shortly that the scale appears to be reasonably reliable and satisfactory, at least above the 1 B grade.[1] It gives fairly reliable data on the individual case, and a distinctly valuable indication as to the average and distribution of abilities in classes, schools, or other groups,— as I hope to demonstrate to you shortly. And you may be interested to know that the scale is being employed quite generally for such purposes; some 90,000 blanks have been used thus far (April, 1920).

Scale of Attainment No. 1 is—as you will see—not a scale of intelligence at all, but is composed of tests of achievement in the various school subjects. We were interested, that is, not merely in the development of tests of intelligence for use with young children, but in the total problem of measurement in the first grades; we wished to have tests not only of general ability, but also of attainment in the specific school subjects. Very little has thus far been done by way of development of group tests of achievement for use in the first two grades. So, the origination of certain test forms seemed necessary. The final result was the word recognition, or reading vocabulary test, for the first grade, forms for which have been placed on the table with the other sample blanks, and Scale of Attainment No. 1—the examination about which particularly I wish to speak.

The examination is the result of an effort to put into a single scale tests covering the fundamental work of the second grade. You may be somewhat surprised at the selection of the tests and subjects. The idea was to include only those subjects which actually *did* affect a child's school progress. So, music and drawing were excluded, as not "promotion" subjects. Writing was also excluded, after a detailed study of the matter, as also not actually a "promotion" subject. Reading was finally concluded to be the most important subject of the second grade, arithmetic probably second, and spelling third. And the final result was a scale (as you see) presenting tests in reading, spelling, and arithmetic. On the first page is a 24-word spelling test. On the second page is the reading vocabulary test. It consists of 5 examples and 24 lines to the test proper, each line consisting of four nonsense syllables and one real word, the children are told to find the real word and draw a line around it. On the third page are the arithmetic tests, first addition and then subtraction. And on the last page is the silent reading test. Again there are 5 examples and 24 lines to the test proper, and each line consists of a sentence with one extra word. The children are to find this extra word and cross it out.

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[1] A more detailed statement with regard to the Primer Scale may be found in the Report of the Sixth Conference on Educational Measurements, pp. 38–45, in the *Journal of Educational Psychology*, September, 1919, and in the *Journal of Educational Research*, for April, 1920.

You wish, of course, to know first of all about the validity and reliability of the tests as measures of the school subjects investigated. And you wish to know, in the second place, whether the tests are sufficiently convenient and practicable for use in a school or school system.

I think you will grant me at once that there is little doubt as to whether the spelling and arithmetic tests measure spelling and arithmetic. The spelling words are taken from Ayres' list. The arithmetic tests are little changed from the Cleveland Survey Tests A and B. Both tests are, then, quite obviously samplings of the abilities they investigate; and in the present make-up they are largely related to materials of already established value. You may wonder, however, whether the two reading tests really do measure the ability of a child to read. There is not time to give you all the facts in the matter. I may say shortly, in the first place, that the words in the word recognition test are taken from Haggerty's[2] visual vocabulary test, and that results from our group test correlate with results with Haggerty's test, the children being tested individually exactly as Haggerty directs, with a coefficient of .82—a correlation so high that it very pleasurably surprised us. If then you can obtain a satisfactory measure of a child's reading vocabulary by showing each child a list of words individually and finding out how many of those words he knows, then you can do the same thing in just about one-fifteenth of the time by using this group test.

We were not sure that Haggerty's test was thoroly satisfactory, however,—and that this correlation validated our test. Therefore, in one of the school systems examined, we obtained a very careful estimate as to each child's reading ability from every second grade teacher. And we found that the word recognition test correlated with estimated reading ability in this total second grade group (156 cases) with a correlation of .71, and that the second reading test correlated with estimated reading ability with a coefficient of .63. So we feel that the tests are distinctly satisfactory measures. All things considered, they seem to give a surprisingly accurate indication as to ability in the subjects they seek to investigate.

But not a few tests yielding a reliable measure are so unwieldy and laborious to use as to make them impracticable. I wish to point out in this connection that this entire scale is presented on the two sides of a single 9-inch by 12-inch sheet; the entire cost of the materials is 75 cents per 100. The examination takes only a brief time to give: 3 minutes apiece is needed for the two reading tests, while 1 minute and 30 seconds is allowed for addition and 2 minutes for subtraction. In fact, the entire examination can easily be given in 25 minutes. And I should like to mention in this connection that it is not an exhausting 25 minutes so far as the children are concerned; there is comparatively little writing (a very laborious exercise for second grade children), and sufficient variety in the tests to hold their interest without effort. Scoring is exceedingly easy. In scoring the two reading tests it is only necessary to note whether the right word in each line is marked; the arithmetic and spelling tests are also comparatively readily scored. We have found, in fact, that it takes only 1 minute to score an entire blank.

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[2] Haggerty, M. E. "Scales for Reading Vocabulary of Primary Children." *Elementary School Journal*, Vol. XVII, No. 2 (October, 1916.)

So much for the scales employed in the present study. There is (1) a group scale of intelligence for measuring the ability of the children, and (2) an examination for measuring the achievement or attainment of these children in their school work. How, now, are these examinations to be used in dealing with practical school problems?

In this second half of my paper I wish, for the sake of concreteness, to summarize to you the results of a recent survey of the schools of a certain Indiana city. And I will limit myself simply to a consideration of the second grade—tho the survey covered all the system from the first grade thru high school. For convenience, I will call the city "City X", and will speak of schools "1", "2", "3", "4", and "5" in this city. It happens, very conveniently, that each school has all of its second grade children in one room and under one teacher. So, comparisons from school to school will be comparisons from teacher to teacher as well.

In a typical school survey an investigation would have been made simply of the *achievement* of the different classes and schools. And only certain subjects would have been covered—subjects chosen partly because tests for measurement in these subjects were most available, partly (perhaps) because the investigator was particularly interested in these subjects. As I hope to demonstrate to you, such surveys often give only partial and often deceptive information about the schools investigated; they constitute at best only a first step in the analysis of the situation.

As we saw it, there were 3 steps to such an analysis. We first (in studying the second grade) gave the Attainment Scale No. 1 I have just described to you, and compared the 5 second grade classes as to "total achievement". By "total achievement" I mean a combination (in a way I cannot take time to detail now) of the scores on all the tests included in the scale. We have thought of such a total as a measure of the total attainment in the work of the second grade. It is very much more than simply the standing of the pupil on those tests in which the investigator happened to be interested, or standing in those tests which happened to be most available. It is, in the first place, a measure of the standing in the *fundamental* subjects. And it is a measure obtained by weighing the subjects in proportion to a carefully determined estimate of their importance. So it is a measure into which is packed a great deal of meaning, —it is a summary statement of what has been learned of the most important elements in the grade.

On this chart I have diagrammed the total standing of the 5 schools of this system according to this "achievement total".

As you will see, the schools differ distinctly. The heavy line thru the middle of the chart indicates the median standing for the entire system, and the extension of each black column above and below this shows the extent to which a given class exceeded, or did not exceed, the median performance for the system as a whole. One school (School 1), was found to have only 22 per cent of its second grade children above the median for the entire city; and contrasted with this is School 2 with 74 per cent above the median. Here are surely striking differences,—and differences in the *fundamental* features of second grade work.

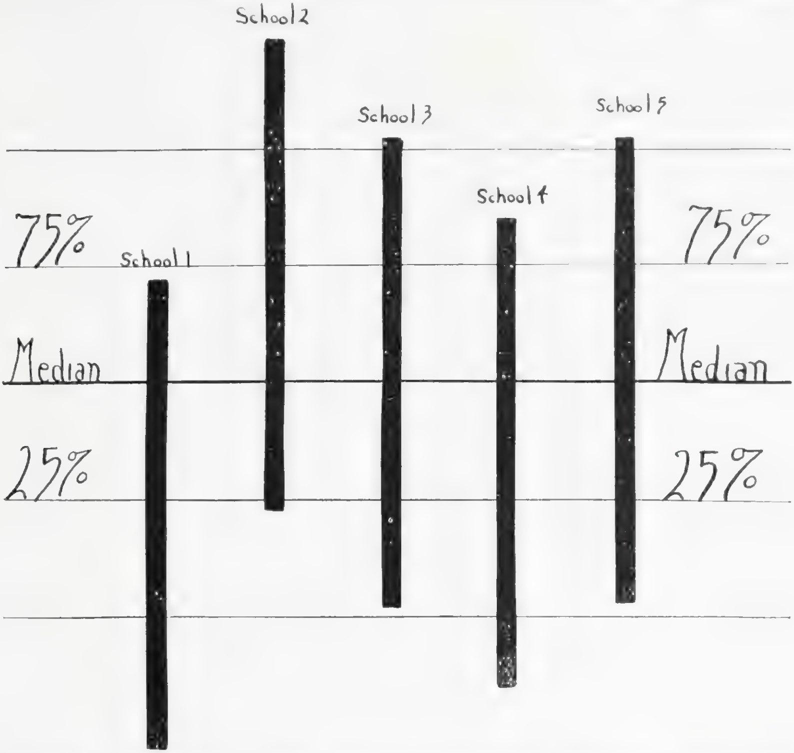

FIGURE I. Difference in school achievement second grades in five schools ("City X"). (Chart shows per cent in each school above the median for the entire system.)

How are we to understand these differences? You will perhaps be inclined to conclude that there are, in this system, some very good, and some extremely poor, second grade teachers. But there are certain other matters which should be investigated before jumping to any such conclusion.

Not only the total achievement of these classes, but the composition of this total, should be known. It is necessary to find out (the second step in the analysis) whether unusual efficiency or deficiency in a single subject may not be a factor in bringing out these differences between the schools. And,—as I think you will at once appreciate,—this Scale of Attainment No. 1 gives an excellent opportunity for finding out about this. If the more usual kind of survey had been given, we would have been immersed in a variety of blanks of different sizes, shapes, and forms of statement. As it was, it was necessary simply to read off from the single blank the score of each child on each test,—the whole procedure was extremely simple. On this second chart you will find diagrammed the result of this second step in the analysis,—a comparison of standing in spelling, reading, and arithmetic. As you will see, the best school and the poorest school in total attainment are the best and the poorest schools in attainment on each one of the separate school subjects. That is, you will say, the teacher in School 1 is a very poor teacher in all subjects, while the teacher of School 2 is equally excellent in all subjects. However, the third school presented shows a very common condition of affairs; this school is high in spelling, about average in arithmetic, and quite low in reading. There are several such differences in the proportional standing of the different

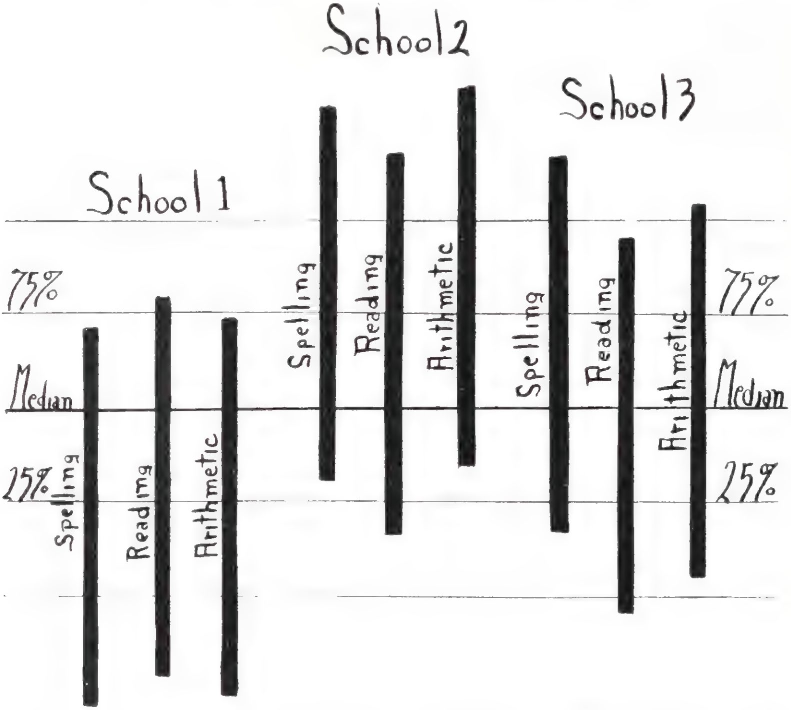

FIGURE II. Differences in comparative standing in spelling, reading, and arithmetic—second grade classes in three schools ("City X"). (Chart shows per cent in each school above the median, for that subject, for the entire system.)

schools in the various subjects, in fact, surprising differences when you consider that all the schools are in one small system. And I think you will see that such an examination as this attainment scale of ours should serve a very useful purpose in pointing out such differences to a supervisor. But the differences found from one subject to another are not such as will explain the differences in total attainment shown in Figure 1. It appears, in fact, as tho there must be some fundamental difference behind the facts expressed in both these charts.

Ratings on the scale of intelligence will help materially in an understanding of the situation. On this third figure you will see (the third step in the analysis) the relative standing of the second grade classes in general ability, the comparisons being made after the same fashion as was used in dealing with the school attainment of these classes. I think you will see at once, if the two charts are put side by side, that the school which is poor in achievement is the school in which the children are dullest. And the most advanced class is the class made up of the brightest children.

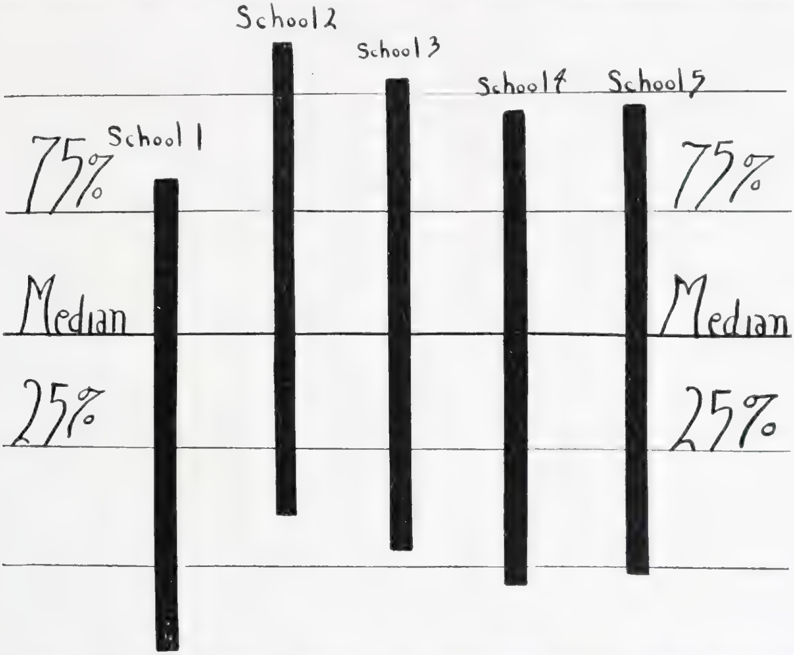

FIGURE III. Differences in general ability—second grades in five schools ("City X"). (Chart shows per cent in each school above the median for the entire system.)

This is not altogether true as you will see from a close comparison of the columns. Schools 4 and 5 appear practically equal in ability, but differ considerably in achievement. And School 1 is relatively poorer in achievement than in intelligence (22 per cent and 33 per cent, respectively, above the median), while School 2 is relatively better in achievement (74 and 62 per cent, respectively. Such results suggest, of course, that the poorest section of town gets the poorest teachers and the best section the best teachers, a situation which, I am sure you will grant me, does sometimes occur. However, the big difference in attainment in school work, when School 1 is compared with School 2, is to be largely explained by differences in the ability of the children attending rather than by differences in the ability of the teachers. And the total educational situation in this school system cannot be understood without measures of both the achievement *and* the ability of the children.

In fact, one at once desires some way of expressing in a single figure this relationship. Perhaps the matter might be put in some such way as this. It might be argued that with teaching of the same efficiency in each school the same comparative standing would be expected, from one school to another, in achievement and ability. The school with 33 per cent of its children above the median in intelligence should show 33 per cent above the median in school achievement; and the school with 62 per cent above the median in ability should show 62 per cent above the median in school work. Then the interesting feature of the situation is the fact that the first school is 11 percentile points below what would, on this basis, be expected of it in school attainment, and the second school is 12 points above. Perhaps the situation will be clearer to you if, with some violence to statistical method, I throw the comparisons into the forms of per cents. If the first school were found to rank at the thirty-third percentile in both ability *and* achievement we might say that the ratio of ability to achievement was 1 to 1, or that the "quotient of achievement" for this class,—or of "teaching efficiency" for this teacher,—was 100. As a matter of fact the average school work for the class is at the twenty-second percentile; we might say then that the quotient for this school was 66. And the quotient for the second school is 120. These quotients might be thought of as indices of the efficiency of the two teachers concerned. The form of statement is relatively immaterial; the point I wish to make clear to you is the importance of taking both factors, achievement *and* ability, into account, in judging a school or a teacher.

To summarize, then: analysis of the results obtained in the second grade classes of "City X" involved 3 steps. (1) The classes were compared as to total attainment in the fundamental subjects of the grade. It was found that there were marked differences from class to class and school to school. (2) The classes were compared as to standing in each one of the fundamental subjects. It was found that the poorest school in total attainment was poorest in all subjects and the best school was best in all subjects. Definite differences in the relative standing in the different subjects were found, however; a school may be definitely above the average in one subject and below the average in another. (3) The classes were compared as to the general ability, or intelligence, of the children composing them. It was found that there were again marked differences, and that the school which was poorest in school achievement was the school with the dullest pupils, while the school making the best showing on the achievement tests was the school in which the children were brightest.

Three recommendations are, therefore, being made to the superintendent of these schools. (1) It is pointed out that his second grade classes differ markedly in achievement in the school subjects, and it is urged that this be taken account of in transferring children from one school to another and in other matters having to do with an interrelation between the schools. (2) It is pointed out that the teachers differ in the amount of emphasis which they put upon the various subjects. And it is suggested that the results be discussed with each teacher, and the teacher urged to build up her weaker subjects,—and that closer supervision is desirable. Finally, (3) attention is called to the differences in the ability of the children in the different schools. And it is urged that a special effort be made, in the school with the brightest children, at acceleration (there were only 2 accelerated children in the entire school); while in the poorest school a special class might be desirable. It is also pointed out, with regard to this last school, that the teacher is not as efficient as she should be,—she may doubtless have been discouraged by the dullness of her children,—and that a trial of methods especially adapted to the teaching of dull children might be made. And it is suggested in closing that by thus taking account of the differences in ability between the schools, and by giving to each of the 5 schools the particular educational treatment adapted to the needs of the children attending, the differences in achievement, mentioned in the beginning, might be lessened.

You will see that the point of view adopted in this work is different from the usual point of view in educational surveys. At a recent meeting of the National Education Association one of the best known school superintendents in the country made the statement that educational tests were very useful—because they gave definite basis upon which to "fire a teacher"! You will notice that no suggestion is made as to the need of "firing" the teacher in School 1. Rather, it is urged that her handicaps be definitely recognized. That is, the same amount of work is not to be expected of every class. Rather, work should be expected of a class *in proportion to the ability of the class.*

In fact, it is believed that a teacher should *not* be judged by the average for her class primarily, but rather according to a very different conception. The conception is a bit unusual, and may seem, at first sight, to be somewhat impractical, and a bit far-fetched, but I feel sure that it at least deserves consideration.

The thesis of this paper has been that the work of a class should not be judged absolutely, but relatively, with reference to the ability of the class. Why not apply the same notion, in judging the standing of an individual child in the class? And would not, then, the most efficient teaching be teaching which obtained, from each child, the full amount of work of which he was capable? That teacher would, then, be the best teacher who developed each child in proportion to his capacity, whether the final achievement were high or low. There should be the highest possible agreement (the highest possible correlation) between ability and achievement. My final chart will indicate to you the extent of this agreement between ability and achievement in the particular city we have been considering.

The figure shows the correlation plot, or double entry table, for scores in "total achievement" (Attainment Scale No. 1), and scores in general intelligence (Primer Scale). Marks at the bottom of the table indicate low achievement scores; those at the top, high achievement scores. Marks to the left of the table indicate low intelligence scores, while marks to the right indicate high scores. As a matter of fact, the correlation is not very high (.52), and the correlation plot tells us why.

You will see that those cases that do not cluster around the line of perfect correlation are "bunched" at the right, below the line. There are no cases who are low in ability, but high in school work; there are no cases appearing in the upper left hand corner of the chart. But we find a great many cases whose ability is good, but who are doing very poor school work. Is it not the big problem of the school with these cases? Evidently, the teachers are not getting from these children the amount of work of which they are capable. And do we not come here to a more satisfactory criterion for judging the efficiency of a teacher? Is not the "efficient" teacher the teacher in whose class the relationship between ability and achievement is the highest? And would not the most satisfactory single criterion be given by the correlation between ability and achievement in a class or system? According to this conception a teacher would be judged not at all absolutely,

—ABILITY—

—ACHIEVEMENT—	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
100												1						
95																		
90															2		2	
85														1				1
80										1			2	2		1		
75									1		1				2	3		
70									1			1	1	2	1	3		
65												1	3	1		1		
60										1	1	1	3	1	1	2		
55										1		3	1	1	2	1		
50										1	4		3	2	1	2		
45										1		4	4	1	1	1		
40				1		1		1		1	3		5		6			
35					1			1	1	2		3	2		1			
30								1	1	4	1	1	1	2	1	2		
25				1		2	1		1	2	1	2		2				
20				1			1					2	1		1		1	
15		1						1			1							
10								1	1		1			1				
5					1													
0	1	1																

FIGURE IV. Correlation between school achievement and ability—total second grade ("City X").

as her class did well or poorly; nor would she be judged primarily according as her class, as a whole, did above or below the average of their ability; instead, a measure of her efficiency would be given by the correlation coefficient of the relation between ability and achievement, in her class.

The notion may seem to you somewhat fanciful, but I am sure you will find it at least interesting to consider. It is merely another way of emphasizing to you the one point that I wish to make, the point that an educational situation cannot be dealt with adequately by use simply of one or two achievement tests, or by the use of either intelligence or achievement tests by themselves. An adequate understanding is given only by measurement in all the fundamental subjects, and *by consideration of achievement in its relation to ability.*

Suggestions with Regard to the Use of Mental Tests, and in Particular with Regard to Their Use in Combination with Tests of Achievement

SIDNEY L. PRESSEY

I WISH first of all this afternoon to emphasize the cautions suggested to you by Professor Thorndike with regard to the use of tests of ability and achievement in the schools. The development of data which shall render the results from such tests readily interpretable with reference to practical school problems has been a principal effort in the work which my wife and myself have been doing during the past year. In fact, we have been interested in three lines of work, all centering around this one question, "How can the scales and tests which we have developed, during the past two years here, be made most useful, and least susceptible of misuse, in practical school work?" And I wish very briefly to take up these points in order.

In the first place, we have tried to find out, *by actual trial*, just how useful our scales of intelligence might be in improving section divisions in junior high school, and also in the first and second grades, and how helpful they might be in "prognosticating" (that is, in forecasting) success or failure, particularly with entering classes in the junior high school, and in the first year of senior high school. We have also tried to find out by actual trial whether or not a child shown by the Primer Scale to be exceptionally bright for his grade, was, *in fact*, a child who could be safely doubly promoted. And we have tried in all these experiments to express our findings in such a percentage form that you might obtain, from the tables, definite information both as to what you might do with the tests and as to the probability of success in such use. We have tried to come to closest possible grips with these problems. If we wished to find out the value of the Cross-Out Scale in improving section divisions, then we have (with the most kind help of Miss Kerr of the junior high school here in Bloomington, whose interest in the work has been of the very greatest value) actually rearranged sections on the basis of the results with these tests, tried these new sections for a half-year, and then found out how many of these changes were sufficiently satisfactory for the teachers to recommend that these children be continued in the sections to which the tests had assigned them. If we wished to find out whether the principal in the junior high school could, by giving such tests to her entering class in September, pick out those who would do poor work and those who would do good work during the next year, then we have given the tests, waited a year, and found out what children *did* do good and poor work—and where these cases scored on the tests given in September. I think you will grant me that such investigations are the ultimate "acid test" as to the usefulness of such scales for you.

Much of this material is already in print. Some of it was summarized in the "circular letter" which I sent out to you, some two or three months ago; further copies of this letter have been placed on the table in the back of the room, so that those of you who may not have received a copy may obtain one now.[1] But I wish to go a step farther than Professor Thorndike has gone in this direction,and point out to you that after all the only way in which to determine satisfactorily the value of such tests for you, and their reliability for your purposes, is for *you* to make such experiments, and find out these matters for yourself! That is, each school and school system has its own problems, and its own ways of meeting these problems; and the only way you can determine the usefulness of such tests is to try them in *your* school system, as an aid in solving *your* problems. Any investigation that we may make will be only approximate so far as your problems are concerned. And (as we say in this letter) we have tried not so much to work over the data in ways that might be of value to you, as to develop methods which might suggest to you ways in which you yourself might appraise the usefulness of such tests for your particular purposes. Some of you are already doing this. Mr. Keener's excellent work at Richmond is an example of just what I mean. Some very fine work along this line is also being done at Evansville.

So much, then, for my first point. We have been trying first of all this year to find out, in the most concrete and definite way possible, just how useful our tests might be to you. And we have gone further than this, and tried to develop simple methods by which you might find out these things for yourselves.

About the second phase of our work, I need say very little since the matter has been largely covered in my wife's paper. We have been much interested this year in the development of examinations which might yield a summary statement of achievement in the work of a given grade. Scale of Attainment No. 1, which my wife has presented to you, is such an examination, for use in the second grade. You have, I think, all seen samples of the blank. We now have the scale fairly well standardized. The blanks are selling at 75 cents per 100. The examination can be given in 25 minutes, and the blanks scored at the rate of 1 per minute. So you will find the scale at least inexpensive and easy to work with. I believe you will find it very interesting to work with as well. In fact, this little scale, with the reading vocabulary scale for the first grade, which my wife has also mentioned to you, make up, I believe, the only satisfactory set of tests for measuring school achievement in the first two grades.

We also have under way a similar scale for measuring standing in the four "promotion subjects," in junior high school,—I think you have all seen the sample blanks. On the first page there is a set of questions in American history, on the second page a series of problems in arithmetic, on the third page an examination in geography, and on the last page a test in English—a test in which we turn the tables on the children, and instead of having them write compositions for us to rate, have them rate certain compositions and measure the accuracy of their ratings! The examination is not yet in final form, but will be, I hope, within the next three weeks.

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[1] The greater part of the material included in the circular letter may be found in three brief papers: "The 'Efficiency' of a Group Scale of Intelligence in Prognosticating Success and Failure in Junior High School", *Journal of Applied Psychology*, December, 1919; "Note with Regard to Professor Thurstone's Method of Critical Scores", *Journal of Educational Psychology*, December, 1919, and "A Group Scale for Use in the First Three Grades: Its Reliability and Validity", *Journal of Educational Research*, April, 1920. Somewhat similar material was also presented in a paper entitled "The Practical 'Efficiency' of a Group Scale of Intelligence," *Journal of Applied Psychology*, March, 1919.

As you will at once see, this idea of combining in a single scale tests in a number of different subjects is somewhat unusual. But I believe you will find it very valuable, and distinctly convenient in supervising the work of your schools. It is undoubtedly of value for you to give a test of ability in silent reading, or a test in arithmetic, or geography, and find out how your schools compare with each other or with other systems. But I think you will grant me that it is much more interesting if you can find out at the same time the comparative standing in geography *and* arithmetic *and* history, and the relative emphasis and efficiency of the teaching in these different subjects. You will also be likely to know much more about the efficiency of a teacher if you give such an examination, and obtain a measure of the *total* attainment of her children.

So much then for my second point,—we have made a beginning at the development of examinations which aim at a synthetic statement of achievement in the fundamental subjects of a grade. How valuable such scales may be remains to be seen. But I think you will grant me that the concept is at least interesting. I hope some of you may find an opportunity to experiment with the scales.

Now just a word with regard to my last point—with regard to the last feature of the work my wife and myself have been doing during the last year. A certain amount of valuable information is gained if a teacher or principal gives a scale of intelligence to a single room or grade. Much more valuable information is gained if not merely a single grade but additional grades, and if possible, *all* the grades in a given school are examined. The data from that school become still more meaningful if other schools of the system have also been examined and cross comparisons are possible. It is undoubtedly of interest to survey a school system with a test of arithmetic, or geography, or history. It is—as I have just suggested to you—much more worth while if tests in a number of subjects can be given, and the comparative standing on these different subjects determined. In all such cases (to use a trite figure of speech) as your data increase arithmetically its value might be said to increase in geometrical ratio. But there is one further comparison which should also be made. There should not be merely measures of ability or measures of achievement, but *a consideration of achievement with reference to ability.* And it is only by obtaining measures of ability *and* achievement that an adequate perspective on the total educational problem in a given school, or school system, can be obtained.

Such extensive surveys may appear formidable to you. I believe you will find them much more easy than you expected. I am sure you will find them exceedingly valuable. I believe very firmly—and I wish to give the matter the emphasis of my final sentences this afternoon—that something of a new epoch in educational measurement is beginning. The first experimental period, the period when test measurements were at best a special method of investigating certain special problems, is passed. Now, such work has developed to the point where tests and scales, if wisely used, may give an exceedingly useful appraisal of entire educational situations. So I wish to urge that, in planning for test work in the future, you plan in a broader, larger way than before. You will, I feel sure, find that such a larger method will yield a wealth of information of the very greatest value.

Symposium on Educational Measurements

1. INTRODUCTORY STATEMENT

Hubert G. Childs

This is the seventh of a series of annual conferences whose purpose has been to focus the attention of educational leaders upon the need and possibilities of more scientific measurements of educational achievements.

Much interest has been shown in this movement: many superintendents have given educational tests of various kinds on their own account and in coöperation with the University Bureau of Research; comparisons of school systems have been made, and much stimulus has been given by these comparative studies. In some cases more careful diagnoses of results have been made, methods devised to adapt instruction to the needs of individual pupils and groups to a greater extent than before. This latter end, which is greatly to be desired, cannot be attained by merely attending conferences, by ordering tests to be given promiscuously, by comparing general results, and then doing nothing to remedy the conditions discovered.

I believe the first step has gone far enough. The next step has been taken by a few schools, and represents the next forward movement in this work, without which the whole will come to naught; namely, the appointment of a research or diagnostic expert to the supervisory staff of city and county school systems. Only thru careful testing and diagnosis of conditions revealed can adequate remedial treatment be invented and applied. In the smaller cities and towns the superintendent must act as such efficiency expert so far as his training and time will permit, but the larger cities and county systems should have a carefully trained staff to direct and evaluate this work. The University School of Education is offering courses preparatory to such work, acts as a clearing-house for sending out tests, for tabulating results, and publishing comparative studies. We are glad to advise with men in the field on request and to render such aid as we can, but one fact is clear, that the public schools of the state are the real educational laboratories and that the direction of this laboratory work must rest in the hands of supervisory officials in the schools who are competent to do this type of work.

This is the end toward which these conferences have been aimed. A few cities have appointed directors of research and tests, and others have such action in contemplation. Two men engaged in such work will speak to us this afternoon: Mr. Dalman, director of the bureau of reference and research of the Indianapolis schools, and Mr. Keener, director of educational tests and measurements of the schools at Richmond, Ind.

2. EDUCATIONAL AND MENTAL MEASUREMENTS IN THE RICHMOND PUBLIC SCHOOLS

E. E. Keener

The purpose of this report is to describe the measurement work in the Richmond (Ind.) public schools as nearly as possible in the order of its growth from the beginning until the present time. Also the effort to "sell" measurements to the teachers and to the community, and the various uses to which results have been put will be discussed. Educational and mental measurements have been used largely for the same purpose, the one a supplement to the other, so they will be discussed together.

This is the first year that measurements have been attempted in Richmond with a view of making the results useful to the teachers, to the administrators, and to the pupils themselves. Heretofore, tests have been given, but often the teacher has never known what the results were, or if she did see the results, she was unable to interpret them in such a way as to help her in her classroom work. The teachers had come to look upon tests as of no practical value, and simply involving a great deal of extra work to no purpose.

The general aim of the department at the beginning of the school year in 1919 was to make standard tests available for the ordinary classroom teacher for use in understanding children as individual problems, in grouping pupils according to ability, in checking the results of experiments in methods of teaching, and in comparing the class with a standard and with other classes. It was thought unwise for a small school system to employ an office force strong enough to do the work required in scoring and tabulating results; so an effort was made to show the teachers that the results of testing were of sufficient value to warrant their spending the time required in giving and scoring the tests in their own rooms. The director of this work was also to act as principal of a grade school and was to spend only one-half of his time in directing the testing outside of that school. So far, the work has been confined to the grade schools principally, but a little measuring has been done in the junior and senior high schools.

Testing was not forced on any school or any teacher, but announcement was made that tests and information concerning tests would be supplied when called for. At first there was little response; so in the beginning the work was carried on chiefly at Baxter School over which the director had direct supervision. A group intelligence test was given to all the children in this school, and the Binet Test was given to the very bright and to the very dull children. Also the Courtis Silent Reading Test and the Woody Arithmetic Scale Series A were used in the proper grades.

The pupils who scored high on both the intelligence and educational tests were allowed to advance more rapidly than the normal rate of progress. Several are doing three half-grades this year. Those who were very dull were given work suitable to their ability as nearly as possible. The ratings secured by these tests enabled the teachers to see each child as an individual problem and to plan the work in such a way as to help each child overcome his individual difficulties. It is bringing to the teachers a realization that "the greatest good to each pupil" is the slogan instead of "the greatest good to the group".

In the first three grades where much of the work is done in groups, the ratings were especially valuable in forming the groups. The groups were made up to be as homogeneous as possible in ability. Both educational and intelligence tests were used for this purpose. The groups did not always remain the same for the different subjects, but were formed according to ability in the subjects. A pupil may be found in the highest group in reading and in the average group in arithmetic. The grouping was always kept flexible so that when the ability of a child in any subject had improved enough for him to carry the work with the next higher group, he was promoted to that group. The brighter pupils were given more work than the average or slow pupils, and were often used as leaders for the slower groups. An effort was made to keep each child working up to the level of his capacity. A child of inferior ability was not expected to do average work, and a child of superior ability was expected to do above average work. In the upper grades the pupils of very low ability were sometimes excused from the less essential subjects like history and geography, and allowed to spend an extra amount of time on English, reading, writing, and arithmetic.

Long before the work in Baxter School was as thoroly developed as has just been described, teachers and principals in other schools, hearing of what was being done, asked for measurements in their own classes. At first they asked for individual mental tests for children who were especially poor in their work. In a number of cases these children were found to be subnormal, but in some cases they were normal, and simply lacked push and determination. When the teacher learned what the difficulty of these children was, she was enabled better to deal with them as individual problems.

Soon requests were made for group mental and educational tests in the various schools. These requests became so numerous that it was decided to extend the tests over the whole city provided there was no serious objection among the principals or teachers. The intelligence tests used were the Primer Scale and the Cross-Out Scale, and the educational tests were the Courtis Silent Reading Test and the Woody Arithmetic Scale.

In order to "put this work across" and "sell" it to the teachers, a meeting was held in each building with the teachers of that building. At this meeting the value of the tests as an aid in understanding the child as an individual problem and in grouping pupils according to ability was discussed. The diagnostic value of educational tests was stressed as one of the most important values. The use of the results in comparing one class with another and with a standard was also emphasized. The limitations of existing tests as an absolutely accurate measure of a child's ability at any one time without regard to temporary conditions were explained. The teachers were told to use caution in forming any definite and far-reaching conclusion from the results of any one or two tests. All tests given, both educational and mental, as well as their own judgment and the opinion of superiors, must be taken into consideration.

These suggested applications of the tests were carried out to some extent in all buildings, but to a much greater extent by some teachers than by others. But the attitude of the teachers toward the principle of testing is highly gratifying. All teachers in the city, so far as I know, are now advocates of intelligence and educational ratings as an aid in fitting methods of instruction to supply more nearly the needs of the pupils. This result of the first year's work alone is well worth the time and money which has been spent in establishing the system in the schools of Richmond. It has paved the way for some real organized and widespread system of procedure next year.

Up to the present time group intelligence tests have been given to practically all children from the first grade thru the eighth grade, and individual tests to nearly 150 pupils. The Courtis Silent Reading Test has been given in nearly all classes from grade 3 to 6 inclusive. The Woody Arithmetic Scale has been used in about all grades from 4 to 6. Most of these tests will be repeated within the next few weeks, and the Woody Tests will be carried thru the junior high school. Other tests have been used in smaller numbers with certain classes and individuals. It is rather difficult to make strict comparisons of classes and schools because the work has been loosely organized due to the fact that tests were used only where requested. The tests were not given at the same time or near the same time in the different schools or classes.

It seems worth while to mention some specific cases where tests have been of special value to teachers. In one second grade the intelligence tests showed that the pupils ranged from moron to very superior in ability. They were arranged into groups as homogeneous as possible according to the results of the tests, their scholarship record, and the judgment of the teacher. The members of the slowest group have learned much more rapidly than they would have done if they had been kept with the regular class. One boy with an I. Q. of 52 had been in school for a number of years without learning to read at all. By putting him in this group where other children were not so superior to him, he has learned to read easy material. Prior to this arrangement the teaching had gone entirely over his head. The brightest group has done much more work than the normal amount for the second grade. Three of the brightest pupils were put into the next higher grade, and their present success indicates that they will continue to advance more rapidly than the normal rate of progress.

The Courtis Silent Reading Test has been given 3 times to a very slow 3B class. The test was given in November, January, and March. The scores for speed for the 3 tests were 70, 75, and 120; questions answered 12, 16, and 14.3; and comprehension 15, 60, and 80. These results include only the scores of the children who were there for all 3 tests. After each test the class was grouped according to the special needs of the pupils. Those below standard both in speed and comprehension formed one group, those below in speed only formed a second group, and those below in comprehension only formed a third group. With this arrangement the teacher was able to give each child the kind of work he needed most. The class now scores above standard in both speed and comprehension, and is below only in number of questions answered. This increase in ability could not have been accomplished by teaching the class as a whole or by grouping them without regard to their individual needs. The children of this class know the standard score for their grade and know whether their own score is above or below this standard. Knowing this helps them to work more intelligently to overcome their own difficulties. The teacher of this class was skeptical as to the value of tests at the beginning of the year, but now she is an enthusiastic advocate of the principle.

The Gray Oral Reading Test was given to the 2 best, the 2 average, and to the 2 poorest readers in the 1A classes in all the schools with the exception of 1. These readers were selected according to the judgment of the teacher. The classes as a whole did not measure up to standard, but the most significant result brought out by the tests was the fact that the schools fell into two distinct groups: 4 very much below standard and 4 near the standard.

Interpreting these results in the light of the intelligence ratings and the racial and social conditions of the communities explains some of this variation. But in one school particularly everything seemed to indicate that the score should be near the top, but it fell with the lower group. The cause of this low score is the methods used by the teacher of this grade. This does not mean that this teacher is inferior in ability, but it does mean that she is using the wrong tools for the most effective instruction. These results will be very valuable in showing the teachers of this grade the superiority of one method of instruction over that of another.

Of those who have been given individual intelligence tests, about 40 are possible subjects for special classes which we are hoping to get started next year. This year these cases have been handled as well as possible with the regular classes, or in some cases have been taken out of the grades and sent to junior high school to spend most of their time in the shops. In two cases they spend half of the day in the shops and have outside employment for the remainder of the day. Those who are spending part of their time with the regular subjects are making no more of a failure than they were doing in the grades.

The chief value of the work this year is that the teachers have come to accept measurements as an aid in understanding children as individual problems, as an aid in grouping children according to ability, and as an aid in establishing more or less definite standards of attainment. Data have been gathered to show the need of special classes for the subnormal, and if these classes are established next year, the regular teachers will be relieved of their most difficult problems, and thus be enabled to give more time to the normal pupils.

The work of the department in the future will be to organize the system so as to make possible a comparison of classes and schools; to apply the results in such a way as to affect methods of teaching, grouping of pupils, and modifications in the course of study; and to have direct and full supervision over whatever special classes are established, to decide which pupils are to be assigned to such classes and which subjects are to be taught in them. The director should have authority to advise on special cases of double promotions and skipping pupils. The results of educational tests interpreted in the light of mental ratings would be very valuable in checking up the effectiveness of the methods used by different teachers, and in determining the relative value of teachers to the schools.

Measurements should be carried into the junior and senior high schools where grouping according to ability is possible to a greater extent than it is in the grades. In carrying this work forward every effort should be made to keep the good will and coöperative spirit of teachers and principals in order that the work may be made more useful to them.